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HELMINTHOLOGICAL ABSTRACTS

Vol. 30, Part 1

REVIEW ARTICLE

The Bionomics of the Free-living Stages of Zoo-parasitic and Phyto-parasitic Nematodes —a critical survey

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Introduction

Plant and animal nematology are two distinct disciplines each with its own terminology, techniques, and characteristic problems. This is convenient and practical for the applied biologist but it hinders the study of the Nematoda as a group. This statement may be criticized as academic because plants and animals are so different that their nematode parasites are different. But, to what extent do animal and plant-parasitic nematodes differ? Is there common ground on which both groups can be considered together? Furthermore, do such considerations serve any useful purpose? In fact, can the nematologists in these two fields learn from each other? The author considers that the two fields of nematology are not irrevocably distinct and contends that the bionomics of the free-living stages of both types of parasitic nematodes are common ground. Each can learn, from the other, techniques and methods of approach to the different problems. Probably studies of pH, hatching, moulting, longevity, invasion, population dynamics and methods of control of the free-living stages of all parasitic nematodes could usefully be considered together, but they are not dealt with in this paper. Stress has been laid here on the relationships between major environmental factors and the behaviour and physiology of nematodes. The object of this article is not to give an exhaustive review of the literature but to examine the subject critically and to include enough references to facilitate further inquiry.

Oxygen

Investigations on the oxygen requirements of zoo-parasitic nematodes have been made chiefly from the aspect of survival under conditions of low oxygen tension.

Most of the data on animal and plant-parasitic nematodes suggest that development is inhibited at low oxygen concentrations (Sprent 1946; Shorb 1944; Lucker 1935; Silverman & Campbell 1959; Stewart & Douglas 1938; Triffitt 1930; Ellenby 1956; Onions 1955, 1957; Shepherd 1959; Hastings & Newton 1934). But the eggs of *Ancylostoma caninum* hatch in water at low oxygen tensions (McCoy 1930). In none of this work, however, have direct measurements of oxygen tension been made and statements that inhibition was caused by lack of oxygen are mostly assumptions.

The oxygen consumption of *Ascaris lumbricoides* increases as the oxygen partial pressure of the atmosphere increases (Harnisch 1933). A similar conclusion was reached by Laser (1944) who also showed that oxygen was necessary for survival and that consumption was considerable even at low oxygen tensions. Prolonged anaerobiosis caused an oxygen debt (Laser 1944,

Mitchell, Nabrit & Smith 1949). The carbon dioxide tension of the medium may also affect respiration (Rogers 1948; Laser 1942). The ability of zoo-parasitic nematodes to utilize oxygen even at low oxygen tensions has been demonstrated by Rogers (1949), who also suggested that oxygen consumption increased with the activity of the nematode. Nielsen (1949) and Santmyer (1956) showed, however, that only a small proportion of the total metabolic activity of soil nematodes was consumed by oscillatory movements. Bair (1950, 1951, 1955) demonstrated that zoo-parasitic nematodes consumed oxygen at a very low and almost constant level over a range of oxygen tensions.

Nielsen (1949), Feder & Feldmesser (1955) and Wallace (1955a, 1955b, 1956d) have also recorded observations on the effect of oxygen tensions on soil and plant-parasitic nematodes.

The work described indicates that oxygen relations of nematodes have been studied from two aspects. Firstly, the hatch, development, oxygen consumption or survival is determined *in vitro* with known oxygen tensions. The variations in oxygen tension in the natural environment are then measured directly or, more commonly, obtained from the data of soil physicists and meteorologists. The behaviour of the nematode in the environment is then deduced. Secondly, the effect on the nematodes of environmental conditions which might be expected to provide variations in oxygen supply is studied, e.g. moisture content of faecal pellets affecting larval development of *Haemonchus contortus* (Silverman & Campbell 1959) or the influence of depth in soil on the rate of emergence of larvae from cysts of *Heterodera schachtii* (Wallace 1956d). Both these methods are open to criticism.

Once the nematodes' reactions to different proportions of oxygen and carbon dioxide are known it is possible to envisage what might happen in the natural environment when its gaseous properties are known. There is plenty of information in the literature on the proportions of oxygen and carbon dioxide in the soil atmosphere. Unfortunately, the soil atmosphere is not the nematode's environment. Nematodes are essentially aquatic and live in the water phase of the soil environment in close association with the soil crumbs. As early as 1915, Russell & Appleyard pointed out that there were two atmospheres in the soil—"one present as free gas filling the pores, and practically as rich in oxygen as ordinary air, the other dissolved in the surface films of water and other substances, almost devoid of oxygen and consisting mainly of CO₂ with some nitrogen". There is little information on the atmosphere in the water phase but it is apparent that the rate of diffusion of oxygen in water is so much slower than in air (about one thousandth) that oxygen could be consumed by micro-organisms faster than its replenishment from the soil atmosphere, resulting in low oxygen tensions in the soil water. Conversely, those nematodes which occur on the soil surface or on the plant above ground must experience oxygen tensions approaching that of the atmosphere. It is clear that experiments on oxygen relations should utilize a wide range of oxygen and carbon dioxide concentrations and that further work is necessary to define the conditions in which the nematode lives in its natural environment.

There are numerous references in the literature to inhibition of hatch, development or activity being due to lack of oxygen, but none has been found where the oxygen concentration in the particular medium has been measured. Such determinations would be extremely useful.

Temperature

The facility with which temperature can be measured and controlled in laboratory experiments is probably reflected in the number of papers on the temperature requirements of nematodes. There are numerous observations on resistance to low temperatures, mortality at high temperatures and optimum temperatures for development. The temperature requirements for different species often differ considerably and lack of agreement between different workers for the same species makes any generalizations difficult.

There are, however, indications that the optimal temperature for development of many species of zoo-parasitic nematode larvae lies in the range 20°C. to 30°C. (McCoy 1930; Cordi & Otto 1934; Furman 1944; Mizelle & Berberian 1953; Rose 1955; Poole 1956).

Although there are examples of nematodes surviving low temperatures for long periods (Levine 1937; Wickware 1940; Poole 1956), development does not occur under these conditions. The minimum temperature for development for many species lies within the 10°C. to 15°C. temperature range (Cordi & Otto 1934; Crofton 1948b; Gordon 1956).

The upper temperature range for survival of zoo-parasitic nematodes is about 45°C. to 55°C. (Cordi & Otto 1934; Levine 1937; Kates 1941; Oelkers 1950; Jettmar & Exner 1951; Germans 1954).

Survival at high temperatures is probably influenced by the physiological condition of the nematode. Thus, desiccated larvae survived exposure to a temperature of 74°C. for 24 hours (Poole 1956). Different developmental stages of the same species may also show different reactions. Embryonated eggs of horse strongyles are more readily killed than unembryonated eggs in faeces over the same temperature range of 7°F. to 32°F. (−13.9°C. to 0°C.), (Lucker 1941). Furthermore races of the same species may have different reactions to temperature. Foster & Daengsvang (1932) found that eggs of the cat and dog strains of the hookworm *Ancylostoma caninum* had different optimum temperatures for hatching.

The temperature relations of phyto-parasitic nematodes are similar to those of zoo-parasitic nematodes. The optimal temperature range for development or hatch is 20°C. to 30°C. (Fenwick 1951; Kämpfe 1955; Wallace 1955a, 1958b; Thomason 1957; Hamblen 1959).

The minimum temperature for development, hatch and activity of phyto-parasitic nematodes is about 10°C. to 15°C. (Godfrey 1926; Tyler 1933; Wallace 1955a, 1958b; Slack & Hamblen 1959).

At higher temperatures (40° to 55°C.) cysts and larvae were killed or inactivated (Triffitt & Hurst 1935; Staniland 1950; Ladigina 1956).

Like the zoo-parasitic nematodes, some closely related species of phyto-parasitic nematodes have different temperature relations. Christie & Crossman (1935) state that the various strains of *Aphelenchoides fragariae* respond differently to high temperatures. It has been shown by Thomason (1957) that *Meloidogyne javanica* has a higher optimal temperature range than *M. incognita* var. *acrita* and *M. hapla*. Kämpfe (1955) found that *Heterodera schachtii* and *H. rostochiensis* have different optimal temperature ranges for activity.

Experiments with nematodes have been usually conducted at constant temperatures. In the soil or on the surface of plants, however, there are considerable diurnal fluctuations. Bishop (1953, 1955) has shown that alternating temperatures increase the rate of emergence of larvae from cysts of *Heterodera rostochiensis* and Wallace (1955a) obtained similar results for *Heterodera schachtii*. This suggests that the relationship between temperature and hatching or activity is not a simple relationship between nematode activity and amount of heat energy received as suggested by Tyler (1933). Gordon (1956) applied the same principle in studies on the rate of development of *Ascaris lumbricoides* eggs at various constant temperatures. A mathematical interpretation of the influence of temperature on development seems a useful approach, however, because it allows a synthesis of nematode temperature relations to be produced in what would otherwise be a series of isolated facts.

To develop such mathematical concepts it would be helpful to understand the mechanisms by which temperature influences development. A comparison of the temperature requirements and reactions of zoo-parasitic and phyto-parasitic nematodes shows many common points. In particular, the minimum and optimal temperatures for development and the maximum temperatures for survival are similar. The survival of nematodes at low and high temperatures is a function of time (Hoshino & Godfrey 1933; Tyler 1933; Hastings & Newton 1934; Staniland 1950; Santmyer 1955; Gordon 1956). Santmyer (1955) suggests that differences in thermal death time between species may represent physiological differences, particularly in enzyme inactivation, and that because enzymes are quickly inactivated above 50°C., thermal death of nematodes above that temperature is not surprising. It might be constructive to extend Santmyer's hypothesis and suggest that the minimum and optimum temperatures for development are also related to enzyme activity. That enzymes are much less susceptible to thermal inactivation when dry than when wet might also partly explain

why some species of nematodes are able to survive higher temperatures following desiccation. Such an approach to the problem of temperature relations in biology is not new. Bělehrádek (1935) refers to the similarity of the temperature relations of enzymic reactions and living matter.

To suggest that enzymic reactions are the basis of temperature relations in nematodes may appear to be too facile a solution. Nevertheless, there is little doubt of the need for research along such lines and for more precise data in order to relate the isolated pieces of data on temperature relations of nematodes which exist in the literature. Knowledge of the temperature relations of phyto-parasitic nematodes is chiefly confined to the three genera, *Heterodera*, *Meloidogyne* and *Ditylenchus*.

Relative Humidity

As far as is known, nematodes can move only when they are surrounded by water, even if this is only a thin film. It follows that, if water evaporates from around the nematode, movement ceases and the nematode is subject to desiccation. Nematodes which occur on the stems and leaves of plants or on the soil surface may be subjected to such drying conditions but in soil they are more or less protected from conditions of low humidity and the effects

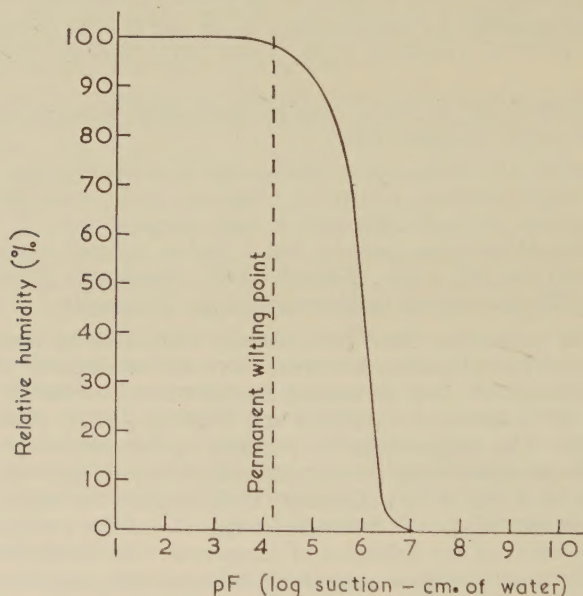


Fig. 1. Relationship between relative humidity and suction in soil at 20°C.

of desiccation are usually only experienced in the surface soil under dry climatic conditions (Collis-George 1959). Thus the relative humidity in the soil even at the wilting point is over 98% (Fig. 1). The osmotic concentration of the water in which the nematodes occur and the soil moisture tension both have a desiccating effect on nematodes but these two aspects will be considered at a later stage.

The drying power of air at different humidities is a function of temperature. Edney (1957) discusses the combined effects of temperature and humidity and describes the application of saturation deficit as a measure of drying power. This has been widely used in entomology but seldom in nematology (Wallace 1955a).

Different developmental stages of the same species of zoo-parasitic nematode show different resistance to desiccation (Stewart & Douglas 1938; Furman 1944; Rose 1955;

Silverman & Campbell 1959). In the phyto-parasitic nematodes, Godfrey & Hoshino (1933) give comparable data for the stages of a root-knot nematode.

Although there are numerous references in the literature to the influence of drying on survival and development of nematodes, definition of the environmental conditions in terms of relative humidity and temperature is so rare that a comparison between zoo-parasitic and phyto-parasitic nematodes is impossible. The little information there is indicates that both groups consist of two types, those susceptible to desiccation and occurring chiefly in the soil during their free-living stages, and those resistant to desiccation and occurring above soil level for part of their life-cycle. Such a relationship between behaviour and resistance to desiccation needs confirmation. The physiology of resistance to desiccation, especially between such widely differing species as *Ditylenchus dipsaci* and *Heterodera* spp. has not been investigated. This, and the relationship between changes in the permeability of the cuticle of various stages and the ability to resist desiccation are worthy of study.

Osmo-regulation

A nematode in dry soil or faeces will tend to lose water unless the osmotic pressure of its body fluid equals the energy of the water in the soil or faeces. Whereas the osmotic pressure of the soil water of agricultural soils varies from about 0.2 to 1 atmosphere, pressure deficiency may rise from zero in waterlogged soil to about 15 atmospheres at the wilting point for plants. Pressure deficiency contributes most to the total soil water energy, in most soils the influence of osmotic pressure on the nematode being very small.

The ability of zoo-parasitic nematodes to tolerate changes in osmotic pressure has been described for very few species (Oelkers 1950; Wilks 1951; Soliman 1953a) but phyto-parasitic nematodes in citrus and papaya plantings were more tolerant to changes in osmotic pressure than were the plants themselves (Machmer 1958).

Data on a more quantitative level is given by Stephenson (1942) who found that water passed both into and out of the body of *Rhabditis terrestris* through the body surface as a whole under the influence of osmotic forces. Stephenson concluded that water exchange is controlled by the living protoplasm rather than the cuticle and in 1944 further demonstrated that inorganic chloride salts penetrate the cuticle, the rate of penetration also being controlled by the living protoplasm. Bird (1959b) suggests that the cuticle of the phyto-parasitic nematode *Meloidogyne* is a living structure and not an inert exoskeleton. Apart from a few experiments on *Ascaris* (Hobson, Stephenson & Beadle 1952; Hobson, Stephenson & Eden 1952; Fairbairn 1957), there is little information on the permeability properties of the cuticle of zoo-parasitic nematodes and, as far as is known, there is no published data concerning the phyto-parasitic nematodes.

Wallace (1956b) concluded that the optimum osmotic pressure for hatch of *Heterodera schachtii* was 0.48 atmospheres, that inhibition of hatch at higher concentrations was due to injury of the larvae through an osmotic effect and that, in the soil, emergence was inhibited when the free energy of the soil water was about 15 atmospheres or near the wilting point of plants. Dropkin, Martin & Johnson (1958) have made similar observations on *Meloidogyne* and have shown that movement of unhatched larvae within the egg stopped at high osmotic pressures (and high soil moisture stress) and consequently hatching did not occur. When the osmotic pressure was lowered, movement and hatching recommenced. Dropkin and his colleagues suggest that this is a mechanism of resisting desiccation in the soil and emphasize the importance of water in determining hatching. Wilson (1958) working with *Trichostrongylus retortaeformis* reached similar conclusions, showing that water permeability is an essential factor in hatching and that electrolytes in solution slow down hatch.

Weinstein (1952) states that the excretory system in the filariform larvae of *Nippostrongylus muris* and *Ancylostoma caninum* is concerned with the regulation of water balance. Weinstein & Haskins (1955) give chemical evidence that filariform larvae of *Nippostrongylus muris* excrete amines via the excretory system. Goodey (1959) has observed an unidentified substance issuing from the excretory pore of *Paraphelenchus* sp. Bird (1959b) has shown that the

excretory system is connected with the hypodermis, which probably secretes the cuticle and is in some way related to moulting. An association between osmo-regulation and the excretory system in phyto-parasitic nematodes has not been demonstrated.

One fact seems clear, that the cuticle of both zoo-parasitic and phyto-parasitic nematode larvae is permeable to water and probably to salts but more information is needed. Many species of nematodes can tolerate variations of osmotic pressure but ability to regulate the osmotic pressure of the body fluid has been demonstrated in only a few species. Which of the different layers of the nematode cuticle controls osmo-regulation has not been investigated. The role of the excretory system in osmo-regulation is virtually unknown; whether its function is mainly excretory is open to question; it is possible that it may have several functions including osmo-regulation, excretion and moulting.

Soil Moisture

It has been emphasized earlier that the free-living stages of phyto-parasitic and zoo-parasitic nematodes depend to a great extent on the presence of water for development and movement. Soil moisture also influences other environmental factors and so measurement and control of soil moisture is fundamental in studies on the behaviour of nematodes in soil. Apart from the important paper by Payne (1923a) most of the information concerning the influence of soil moisture on nematodes has come from the field of phyto-parasitic nematology. Relevant papers from other zoological fields have also appeared in recent years (Parry 1954; Maelzer 1956). Although many zoo-parasitic nematodes inhabit faeces the data on soil moisture could be applied to faeces since both are porous media and subject to the same physical laws.

Qualitative observations on the influence of soil moisture on the activities of parasitic nematodes have been made for three plant parasites and several more animal parasites (Triffitt & Hurst 1935; Dinnik & Dinnik 1939; Christenson & Creel 1942; Beaver 1953; Germans 1954; Ferris & Mai 1956; Feldmesser & Feder 1957; Silverman & Campbell 1959).

The effect of waterlogging on survival of parasitic nematodes has been described for *Heterodera rostochiensis* (Böhm 1956), root-knot nematodes (Brown 1933) and *Heterodera schachtii* (Murre 1947).

It is likely that the inhibitory effect of waterlogged soils on nematodes, is primarily an aeration effect. Johnston (1958) suggests that there are more bacteria available at higher moisture contents and that reduction in numbers of phyto-parasitic nematodes at saturation levels is probably due to some cause other than soil moisture. Godfrey, Oliviera & Gittel (1933) state that larvae of *Meloidogyne* persisted for 40 weeks in soil kept continuously at the moisture equivalent. Excess moisture caused increased mortality. The higher mortality of *Heterodera rostochiensis* in moist soil than in air-dried soil (Mai 1952) seems likely to be an aeration effect also, although other factors cannot be excluded.

Attempts to express moisture content in more quantitative terms have been made. Godfrey (1926) used moisture holding capacity (field capacity); Linford (1941) expressed soil moisture in terms of the moisture equivalent and wilting coefficient. Seinhorst (1950) used moisture equivalent as his criterion and Peacock (1957) expressed moisture content as a percentage of the moisture holding capacity.

The value of a criterion for measurement of soil moisture is probably determined by its reproducibility under experimental conditions and ease of measurement. The term percentage moisture content is completely untenable as a measure of soil moisture. Wilting point and field capacity are important moisture constants which are explicable in terms of more or less understood factors but incapable of precise definition. Other constants, such as the hygroscopic point (pF 4.2) and the moisture equivalent are capable of reproducible laboratory determinations and approximate to the indefinable constants of the first group, e.g. the field capacity is equal to the moisture equivalent and wilting point is equal to hygroscopic point (pF 4.2) (Childs & Collis-George 1948). The ratio of field capacity to moisture equivalent depends on the soil type (Browning 1941; Smith & Browning 1947). The measurement and description of the soil moisture environment in terms of these moisture constants is, therefore,

difficult and excludes consideration of the geometry of the soil pore spaces and the distribution of water in the pores, factors of great importance in nematode activity. Control of soil moisture in pots by adding water to bring the soil to a predetermined weight creates moisture gradients and may give completely misleading results.

Soil moisture is best considered from a mathematical consideration of the relationship between the surface tension properties of the soil water menisci and the geometry of the soil pores. For any soil or soil fraction it is possible to measure the water content over a range of

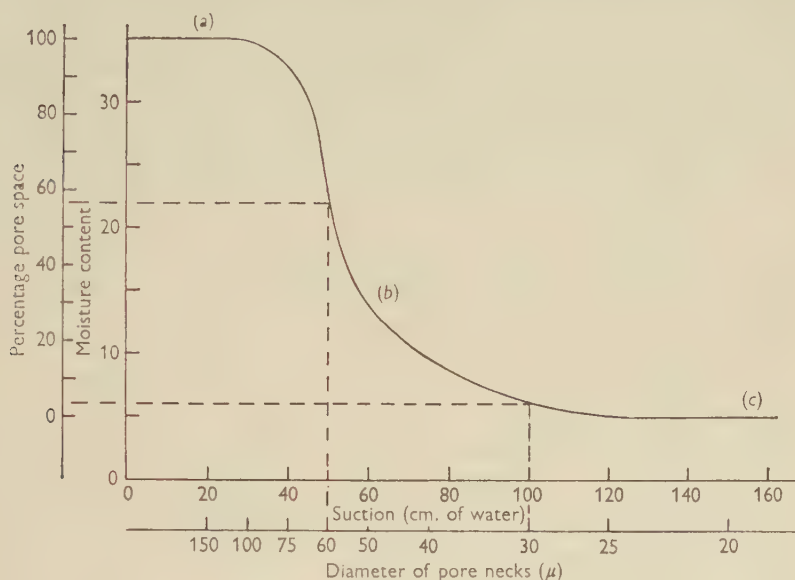


Fig. 2. The moisture characteristic of a hypothetical soil sample (a) pores full of water (b) pores emptying (c) pores empty (after Wallace 1958a).

applied suctions, so obtaining a moisture characteristic (Fig. 2) that can be used to give information about the size distribution of pore-necks (Childs 1940; Childs & Collis-George 1950).

Wallace (1954, 1955a, 1955b, 1956a, 1956d, 1956e, 1959d) has utilized the moisture characteristic in studies on the emergence of larvae from cysts of the beet eelworm *Heterodera schachtii*. Shepherd & Wallace (1959) compared the rates of emergence and invasion of beet eelworm and pea-root eelworm by this technique. Similar studies on the movement of nematodes in soil and their attraction to roots have been made by Wallace (1956c, 1958a, 1958b, 1958c, 1959a, 1960). Movement of nematodes will be considered later; at this stage it is sufficient to say that by using the concept of the moisture characteristic it has been possible to develop hypotheses explaining the movement and behaviour of phyto-parasitic nematodes in soil in relation to soil pore size and water distribution. Collis-George & Blake (1959) have used similar techniques to investigate the influence of soil moisture on the expulsion of the larval mass of the phyto-parasitic nematode *Anguina agrostis* from galls. It is interesting that Payne (1923a), in studies on the movement of hookworm larvae in soil, emphasized the importance of the relationship between particle size, pore size and water distribution and described the influence of the surface tension of the soil water meniscus on nematode movement.

The moisture characteristic is evidently a versatile tool and its application to the study of behaviour of zoo-parasitic nematodes would yield useful results.

Soil Type

Several plant nematologists have stated that infestations are highest on light sandy soils. This generalization seems to hold for several species, (Boyd 1943; Sleeth & Reynolds 1955; Endo 1959—Fig. 3). Ahlberg (1952), however, states that the rate of multiplication of *Heterodera rostochiensis* is less in sandy soils than in clay soils. Grainger (1951) could find no evidence of a relationship between soil type and population levels of *H. rostochiensis*. Wallace (1956d) showed that even small amounts of clay depressed the emergence rate of *Heterodera schachtii* larvae and that the rate of emergence in different soil types could be correlated with the oxygen consumption of the soils. Caveness (1958) in the U.S.A. found that the density of populations of *Heterodera schachtii* was not related to soil type and agreed with Wallace (1956a) that soil structure was important. Seinhorst (1956, 1957) consistently found that populations of *Ditylenchus dipsaci* decreased more in light soils than in clay soils.

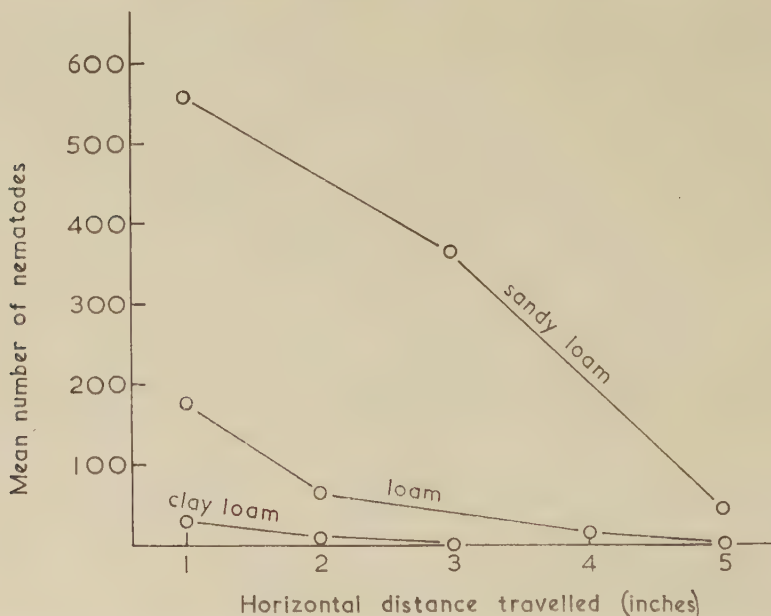


Fig. 3. Distance travelled by *Pratylenchus zeae* in three soil types after 4 months in the presence of corn plants (after Endo 1959).

The evidence on the relationship between soil type and the density and activity of phyto-parasitic nematodes is, therefore, conflicting and the generalization that plant-parasitic nematodes are more active in light sandy soils is not altogether supported.

Information on the relationship between soil type and zoo-parasitic nematodes is scanty. What evidence there is indicates that movement of nematodes is greater in sandy soils than in clay soils (Payne 1923b; Lucker 1936, 1938; Bruns 1937). These observations all refer to migration of nematodes. Data for survival of zoo-parasitic nematodes in different soil types is confined to observations on *Ascaris* eggs which survive longer in heavy clay soils (Beaver 1952; Seitz 1953).

It appears, therefore, that light sandy soils provide optimum conditions for the migration of zoo-parasitic nematodes and clay soils favour survival. There are no data on the survival of phyto-parasitic nematodes in different soil types but it seems possible that Seinhorst's observations that populations of *Ditylenchus dipsaci* decline more in sandy soils than in clay soils is a question of survival. *D. dipsaci* infests host plants at or just above ground level and

is, therefore, active on the surface of the soil for a part of its life-cycle. In sandy soils the nematode may be subjected to greater extremes of desiccation than in clay soils which retain more water, with consequent greater mortality in the sandy soils. This is obviously a subject for further research.

That the data for the rest of the phyto-parasitic nematodes are conflicting may be due to several reasons. Observations on population densities and soil type must take previous cropping history into account. Experiments on the influence of soil type on infestation levels in host plants are difficult to evaluate. The plant itself may respond to soil type and so confound the results; furthermore, infestation level is the end product of a series of events—hatching, migration, survival, invasion and development—each of which may be affected to a different degree by the physical factors associated with soil type. The most likely cause for confusion, however, probably lies in the term “soil type”. Soil types are classified according to their proportions of sand, silt and clay. Such a classification is essentially textural and omits consideration of structure. The degree of aggregation of soil of a given texture is an expression of the previous history of weathering, cultivation, climate etc., and varies considerably. Soil structure is better thought of in terms of pore spaces where the nematodes move, rather than the solid matrix of soil crumbs.

The conflicting evidence on the relationship between soil type and nematode activity may be due to the exclusion of structure as a factor. Wallace (1960) found greater differences

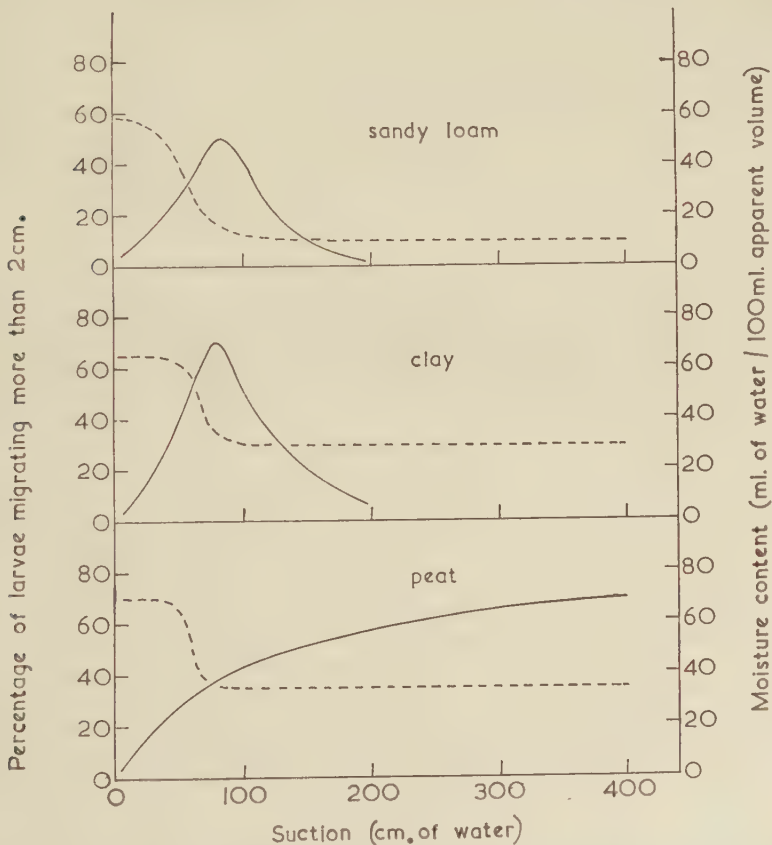


Fig. 4. Mobility of larvae of *Heterodera rostochiensis* in three soil types of crumb size 150–250 μ . The dotted line indicates the moisture characteristic (after Wallace 1960).

in larval mobility of *Heterodera rostochiensis* between different crumb sizes in the same soil type than between different soil types with the same crumb size (Fig. 4). This observation supports the hypothesis that soil structure is the important factor.

Movement

Nematodes, whatever their host, move by undulatory propulsion. The muscular system, internal pressure and cuticular structure are well adapted to such a type of locomotion (Harris & Crofton 1957). The mathematical analysis of this type of progression has been investigated in detail for a number of small organisms and for snakes by Gray (1946, 1951, 1953) and the small amount of work along these lines with nematodes (Wallace 1959c) does not contradict Gray's hypotheses. *Criconeimoides* spp. move by alternately extending and contracting the body along the longitudinal axis (Taylor 1936; Thomas 1959) but no information is available on the mechanics of this type of movement. The free-living stages of parasitic nematodes occur either in the soil or above soil level on the outside of plants and on the surface of the soil. Movement in these habitats can be classified as either active or passive.

Movement in soil

Qualitative data on the migration of zoo-parasitic nematodes have been given for several species (Payne 1922, 1923a; Mohler 1935; Lucker 1936, 1938; Spindler 1936; Bruns 1937; Furman 1944; Beaver 1953).

In the phyto-parasitic nematodes the movement of *Ditylenchus dipsaci* reaches a maximum at 120% to 150% of the soil moisture equivalent (Seinhorst 1950). Studies on the vertical migration of larvae of *Heterodera rostochiensis* in soil (Peters 1953) indicated that the extent of upward and downward movement was similar but was inhibited in waterlogged soil. Mountain & Boyce (1958) suggest that soils of fine texture limit the movement of *Pratylenchus penetrans* and Endo (1959) obtained similar results for *Pratylenchus brachyurus* and *P. zeae*.

These observations on nematodes in soil indicate that movement may be influenced by soil texture and moisture but few measurements have been made of the actual physical factors involved. Payne (1923b) was the first to suggest that nematode movement was related to the surface tension of the capillary soil water and to movement of water within the capillary zone. Payne's work is substantiated by recent work on the movement of phyto-parasitic nematodes. Wallace (1956c) showed that movement of *Ditylenchus dipsaci* in sand was related to hydrostatic pressure deficiency or suction, which has been discussed previously. The observations suggested that *D. dipsaci* moved further in a thin water film than in a thick layer and were the basis for further research on the influence of pore size and moisture content of the soil on nematode movement (Wallace 1958a). The optimum film thickness for movement was found to be about 2μ to 5μ and it was concluded that the "moisture characteristic" supplies most of the information required about the physical properties of the soil in relation to eelworm movement. A comparison of movement in soil of *Heterodera schachtii* and *Ditylenchus dipsaci* (Wallace 1958b) indicated that for both species, mobility was greatest when (i) there were few pores smaller in diameter than the nematode width, (ii) the pore diameter was narrow enough to restrict lateral movement and (iii) the tortuosity of the channels between particles was such that the body form of the nematode had waves of long wave-length and short amplitude. Wallace (1958a) also showed that the speed of nematode movement was a function of its length and activity. With increasing eelworm length there was an increase in soil particle size for maximum mobility. Wallace (1960) also studied the mobility of *Heterodera rostochiensis* larvae in three soil types, sandy loam, heavy clay and peat. With the same crumb size, mobility was very similar in sandy loam and clay but in the peat larvae were able to move at much higher suctions. Wallace concluded that many of the movements of plant-parasitic nematodes were explicable by considering the relationship between pore size, nematode diameter and length, and water distribution.

Movement above soil level

Migration on the surface of soil or on the outside of plants is usually in a more or less continuous water film or among a discontinuous array of water drops. The importance of such movement in zoo-parasitic nematology is based on the fact that many animal hosts are infected by eating plants which have infective nematodes on them.

The influence of physical factors on the vertical migration of zoo-parasitic nematodes has been described by Fülleborn (1932), Rogers (1940), Furman (1944), Crofton (1948a, 1948b, 1954), Rees (1950) and Tarshis (1958).

Data on the phyto-parasitic nematodes are confined to the chrysanthemum eelworm, *Aphelenchoides ritzema-bosi*, (Wallace 1959b; Hesling & Wallace, 1961).

Temperature, humidity, water and light are probably the chief factors influencing movement above soil level. The type of plant and the proximity of leaves and stems probably affect lateral movement to a great extent. There is no information on the influence of light and temperature on the migration of phyto-parasitic nematodes; work on these factors would be very useful.

Passive movement

Studies on the movement of nematodes in soil and on the surface of plant leaves and stems have been mainly concerned with static conditions. In the soil and on plants, however, during and after rain there is a downward movement of water. In soil, the percolation of water is governed by physical laws inherent in the properties of a porous medium and much research in soil physics has been done on this phenomenon. On the surface of plants, however, the factors governing movement of water are probably related to the surface properties of the particular plant species under examination (Wallace 1959c). Factors such as wind (White 1953) and floods (Thompson, Roebuck & Cooper 1949) may also disperse eelworms but the influence of such factors is limited.

Peters (1953) found that percolating water tended to carry larvae of *Heterodera rostochiensis* downwards in soil. Ducharme (1955) showed that in sandy soils the percolation of water influenced the direction and rate of movement of *Radopholus similis* so that they travelled long distances downwards in a short time. Payne (1923a, 1923b) suggested that vertical movements of water in the soil were responsible for movements of hookworm larvae to the soil surface. Legler (1950) described the effect of percolating water on the transport of *Ascaris* eggs into the soil. Wallace (1959a) studied the relationship between the rate of flow of water through sands of different particle size and the downward velocity of nematodes of various lengths and activities and established that the velocity of the nematodes decreased with decreasing pore diameter and approached zero when the nematode's length exceeded four times the pore diameter; the relationship between velocity of nematode and velocity of water was independent of the nematode's own activity; dead or inactive nematodes did not progress very far in sand even at high flow rates and observations suggested that slight flexing movements of the nematode body were essential for passage.

The passive movement of nematodes in moving water is probably important in the vertical distribution of nematodes on plants and in the soil but no research has been done on this aspect. The spread of the stem eelworm, *Ditylenchus dipsaci*, downhill in growing host crops is a well known phenomenon (Fig. 5) but the influence of soil texture, amount of rainfall, permeability of the soil and slope of hill are unknown. It is possible that similar factors affect the spread of zoo-parasitic nematodes. Research on this, and ecological studies are also needed to investigate the influence of particle size, soil structure, moisture and eelworm length on nematode movement in the field.

Orientation

Orientation is a process whereby the direction in which a nematode moves is influenced by external stimuli. This may involve the stimulation of sense organs and receptors, or directed

movements may be due to a simple mechanical effect, such as the trapping of strongyloid larvae in water drops on grass stems. To distinguish between these two types of movement is not always easy because no one has yet demonstrated sense organs in nematodes. Steiner (1955) suggests that the "cheeks" on the head of male root-knot larvae are chemoreceptors. Paramonov (1954) considers that some types of phasmids may be sensory. Gofman-Kadoshnikov and colleagues (1955) claim that amphids are chemoreceptors. Hirschmann (1959), however, states that although the structure of cephalids, amphids and hemizonids are well defined, their biological functions are unknown.



Fig. 5. Spread of infestation of *Ditylenchus dipsaci* downhill in lucerne (photograph reproduced by permission of Mr. E. B. Brown).

There are numerous examples in the literature of orientation in parasitic nematodes but it is clear that in some cases the experimental methods and interpretation of results are in doubt. Crofton's (1954) experiments showing that vertical movements of strongyloid larvae on grass can be explained in terms of normal random movement and variations in the physical factors of the environment, are in direct opposition to previous work on the subject, which referred to such movement in terms of a geotaxis.

Most of the work to be described on the different types of orientation is of an uncritical nature and an appraisal of cause and effect is virtually impossible. The examples illustrate, however, the critical points just made.

Geotaxis

Observations on the vertical migration of parasitic nematodes as a geotaxis have been made by Stewart & Douglas (1938), Buckley (1940), Furman (1944), Sprent (1946), Rees (1950) and Wallace (1959b). Reesal (1951), however, stated that the upward migration of infective larvae of *Strongyloides agoutii* is due to random movement and Payne (1923b) emphasized that nematodes in a film of water would experience little gravitational pull and would, therefore, exhibit no geotaxis. Crofton (1954) agrees with Payne and discounts the evidence of Buckley (1940) who stated that *Trichonema* sp., *Haemonchus contortus* and *Ancylostoma caninum* were positively geotropic at specific temperatures. Crofton (1954) suggests that the use of the word geotaxis implies some inherent selective behaviour pattern of the nematode and there is no evidence for this. Vertical migration of larvae can be described in terms of

normal larval movements without references to special receptors in the larvae (Fig. 6). Thus, the distribution of infective larvae of *Trichostrongylus retortaeformis* on herbage is not due to a geotaxis but to an accumulation in that part of the herbage in which there is least climatic change (Crofton 1948a).

Rheotaxis

Voss (1930) states that the movement of chrysanthemum eelworms up stems is induced by downward flowing water during rain and Weischer (1959) suggests that larvae of *Heterodera rostochiensis* and *H. schachtii* exhibit rheotaxis in moving with a stream of root diffusate in a

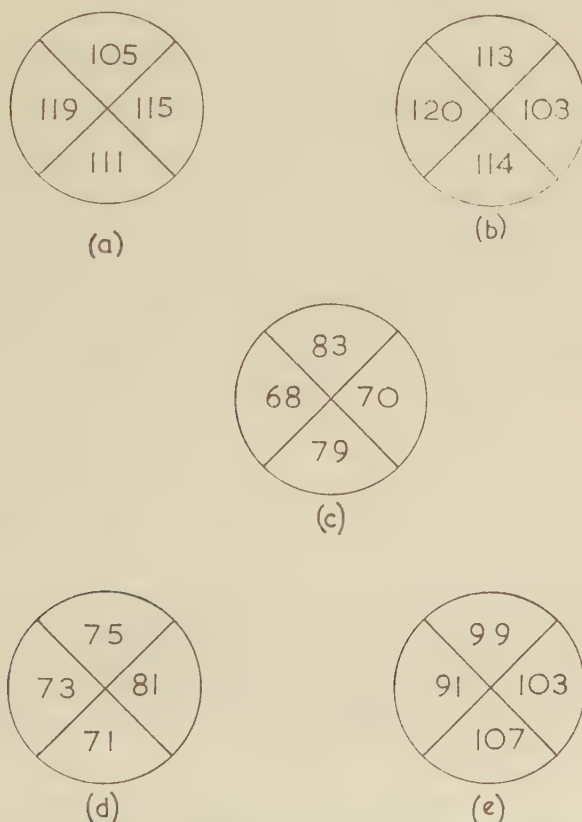


Fig. 6. Distribution of larvae of zoo-parasitic nematodes moving on a vertical plane, indicating no geotactic movements. (a) *Trichostrongylus retortaeformis* at 17°C. (b) *T. retortaeformis* at 27°C. (c) Sheep trichostrongyles at 17°C. (d) Sheep trichostrongyles at 27°C. (e) Horse trichonemes at 16°C. (From data by Crofton, 1954.)

horizontal wick. Neither of these observations attempts to show the effect of the fluid current on passive movement. Wallace (1959b) demonstrated that most chrysanthemum eelworms moved upwards on a stem in a stationary water film and that downward currents tended to wash the nematodes down. Fülleborn (1932) showed that *Ancylostoma* and *Strongyloides* larvae tended to face a water current because they were heavier anteriorly. Lane (1933) stated that this was not a rheotaxis because it was a simple mechanical effect. Peters (1952) found that *Turbatrix aceti* moved upwards because they were tail-heavy but he described this as a negative geotaxis.

There is, therefore, little evidence of rheotaxis in nematodes.

Hydrotaxis

Observations such as those of Spindler (1936), Bruns (1937) and Beaver (1953) suggest that nematode larvae in soil may migrate upwards to higher moisture levels, but Lane (1930, 1933) and Reesal (1951) state that this cannot occur because nematodes are always in water.

It is unlikely that nematodes possess any sense organs which enable them to detect changes in soil moisture content; consequently the arguments against hydrotaxis are probably valid. A mechanical response to a moisture gradient seems possible, however. Wallace (1960) showed that larvae of *Heterodera rostochiensis* moved to the wet end of a moisture gradient in

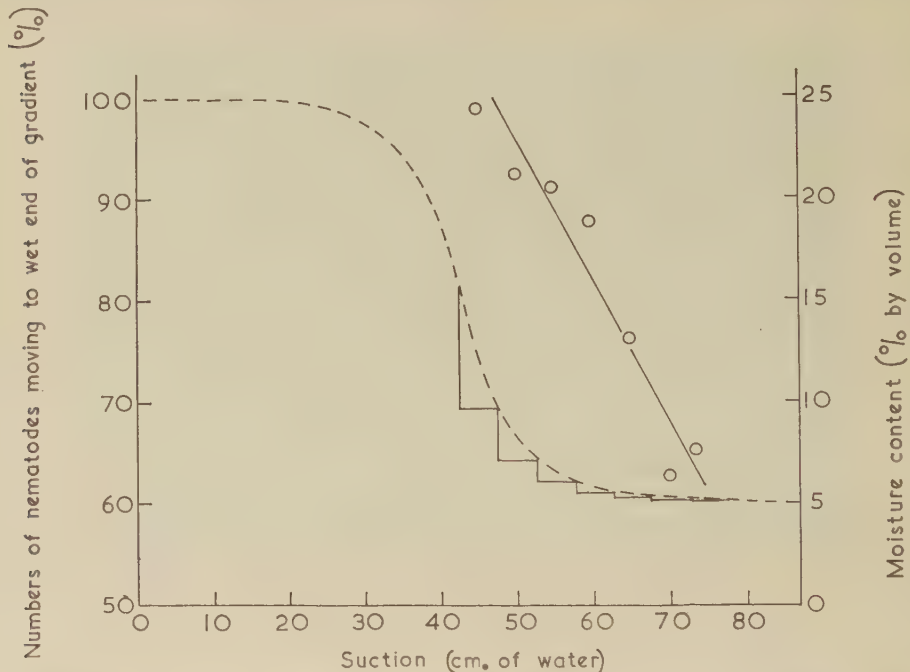


Fig. 7. Relationship between the moisture gradient and movement of larvae of *Heterodera rostochiensis* in sand of 150–250 μ particle diameter. The dotted line indicates the moisture characteristic and the horizontal and vertical lines show the steepness of the moisture gradient at different suctions (after Wallace 1960).

sand in both an upwards and downwards direction (Fig. 7). It was shown that the optimal pore size for such movement corresponded to the optimal conditions for mobility but the physical factors involved were not determined. More research is needed to elucidate this problem.

Chemotaxis

Evidence for chemotaxis is almost entirely obtained from studies on the influence of chemical substances released from roots on the activities of plant-parasitic nematodes. Early observations that plant roots secreted substances capable of attracting nematodes (Stewart 1921; Baunacke 1922) were substantiated by Linford (1939) who found that root-knot nematodes were attracted to a region of the root just behind the apex. Similar conclusions were reached by Gadd & Loos (1941), Wieser (1955, 1956), Lownsbury & Viglierchio (1958), Wallace (1958d) and Peacock (1959).

Kühn (1959) states that it is unlikely that diffusion gradients of attractant chemicals occur in soil and he suggests that nematodes move at random and on reaching a root accumulate

there under the response of some chemical secreted by the root into the rhizosphere. Weischer (1959) supports Kühn's findings but Wallace (1960) states that larvae of *Heterodera rostochiensis* orientate themselves to roots at a distance of about 2 cm. Until there is information on the distance over which chemical gradients extend in the soil and the dimensions of the rhizosphere such arguments will remain academic.

Nematodes may respond to chemical stimuli associated with oxygen concentration (Lees 1953), carbon dioxide (Klingler 1959) or with metabolic products of bacteria in the rhizosphere (Bergmann & van Duuren 1959). Such observations emphasize that, in attempts to demonstrate chemotaxis, other factors associated with growing roots should not be ignored.

Galvanotaxis

The fact that electrical potential gradients occur around plant roots invalidates the criticism of Fraenkel & Gunn (1940) that stimulation of animals by electric currents is rarely a natural phenomenon. Bird (1959a) showed that the principal factors attracting root-knot nematode larvae to roots was redox potential. He suggested that the larvae moved along a gradient of decreasing potential as they moved to the root. Caveness & Panzer (1960) showed that, on passing a current between an anode and cathode in water agar, several free-living and phyto-parasitic nematodes migrated to the cathode. A similar response was found for *Ditylenchus dipsaci* and *Turbatrix aceti* by Jones (1961) who showed that the response was dependent on potential gradient rather than the size of the current. A minimum threshold value of 30 mV per mm. was demonstrated. Orientation in a potential gradient also occurred in a sand water medium with *D. dipsaci* and *Heterodera schachtii*.

The fact that the threshold of response for nematodes is of the same order as the potentials developed on roots supports Bird's (1959a) hypothesis that nematodes are attracted to roots along a potential gradient.

Thermotaxis

Information on the orientation of parasitic nematodes to temperature is confined to zoo-parasitic species. Fülleborn (1932), Lane (1933), Sprent (1946) and Reesal (1951) claimed to have demonstrated thermotaxis whereas Soliman (1953b) states that larvae of *Dictyocaulus* spp. are not thermotactic. None of these workers studied the influence of temperature gradients on the migration of nematodes and an assessment of their results is difficult, especially as other factors such as humidity and soil moisture content are influenced by temperature. Parker & Haley (1960) have shown that larvae of *Nippostrongylus muris* are positively thermotactic on agar. Research on movements of parasitic nematodes in temperature gradients under controlled conditions would be valuable, particularly in studies on the vertical distribution in soil and in optimum temperature requirements for different species.

Thigmotaxis

This method of orientation is defined as the influence of mechanical stimuli (touch, pressure, vibrations) which determine the direction in which the animal moves. In this strict sense, the claim by Fülleborn (1932), Lane (1933) and Reesal (1951) that increased movements of zoo-parasitic nematodes on reaching an obstacle, accompanied by orientation at right angles to the obstacle's surface, is a thigmotaxis, is not correct. Such behaviour is really a thigmokinesis because there is no directional response. The aggregation of nematodes in clumps, as in *Strongyloides*, *Ancylostoma*, *Ditylenchus* and *Aphelenchoides*, may also be a thigmokinesis but other factors such as mutual attraction (taxis) and adhesion through stickiness of the cuticle probably also play a part.

Phototaxis

Evidence for the influence of light on nematode movement is, with one exception, restricted to zoo-parasitic species. Staniland (1957) showed that on exposure to light rhabditid nematodes appeared on the surface of peat casts and waved about in the air in a hydra-like mass. Positive phototaxis has been recorded for *Panagrellus silusiae* by Lees (1953), *Bunostomum phlebotomum* (Sprent 1946), *Strongyloides agoutii* (Reesal 1951) and *trichostrongyle*

larvae (Rogers 1940). Soliman (1953b) found that first-stage larvae of *Dictyocaulus* spp. were positively phototactic and Buckley (1940) claimed that infective larvae of *Trichonema* spp. showed a negative phototaxis. Parker & Haley (1960), however, showed that the movement of larvae of *Nippostrongylus muris* to light is a response to the heat produced by the light source. This result throws doubt on previous work on phototaxis. It would be useful to know if those species of phyto-parasitic nematodes which occur above soil level are influenced by light.

To sum up the work on orientation in nematodes it can be said that there is strong evidence for the occurrence of chemotaxis, galvanotaxis and thermotaxis, but quantitative evidence from controlled experiments is lacking. There is little evidence that the other types of orientation occur at all.

Conclusions

To assess the similarity of phyto-parasitic and zoo-parasitic nematodes in their reactions to the environment would entail a comparative study of representatives of both groups under similar experimental conditions. As far as is known, this has never been done; nevertheless, the existing data indicate that there are no distinct differences between the two groups. There is no evidence of any fundamental difference in physiology or behaviour between the two groups and, in fact, in temperature, oxygen and osmotic requirements they are similar. Information on movement and orientation also emphasizes this similarity. Biochemical physiology of parasitic nematodes has not been considered here because little work has been done on plant-parasitic species. It is revealing, however, that Krusberg (1960) has shown that *Ditylenchus* has an over-all metabolism which follows the general pattern established for the animal-parasitic nematodes. Similarities between the two groups may thus extend beyond the free-living stage.

Each of these two groups of nematode parasites has often been studied from a particular aspect but there is much common ground for the study of them as a single group.

Nematologists, by broadening their field of study to include observations on both the plant and animal parasites, can derive new ideas and methods of approach relevant to their own investigations.

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ABSTRACTS

When an address accompanies an abstract, it is that of the first author.

MEDICAL HELMINTHOLOGY

Surveys

No relevant abstracts in this issue

Trematoda

- 1—BARUFFA, G., 1960. [Servizi Sanitari della S.A.I.S., Villaggio Duca degli Abruzzi, Somalia.] "Osservazioni sulla epidemiologia della schistosomiasi vescicale nel distretto di Gelib (Basso Giuba-Somalia)." **Rivista di Parassitologia**, **21** (1), 1-12. [English summary p. 11.]

On the basis of studies carried out during 1955-58 involving several hundred cases of urinary schistosomiasis, Baruffa concludes that the incidence of this disease in the middle and lower course of the Juba river, is closely related to the seasonal floods. *Bulinus (Physopsis) abyssinicus*, the intermediate host of *Schistosoma haematobium* in Somalia, breeds extensively in local depressions which retain flood waters for a considerable time. The snail also breeds abundantly in irrigation canals, but the river itself is only an indirect cause of its distribution. The incidence of schistosomiasis was found to range from 15% to 78% (the latter observed in an agricultural centre with irrigation). 62% of 266 persons reported that haematuria had started during the period December to May, which would mean that they were infected during the flood season, October to December. The greatest incidence of infection, as observed in 525 patients, was among males in the 15 to 25 year age group. The author goes on to consider the danger of irrigation and the possibility of final eradication of the disease. N. Jones

- 2—BRYGOO, E. R., 1959. [Institut Pasteur de Madagascar.] "Les bilharzioses et l'extension des cultures irriguées à Madagascar." **Bulletin. Institut de Recherches Agronomiques de Madagascar**, No. 3, pp. 194-198.

Brygoo discusses schistosomiasis in Madagascar with particular reference to the distribution of the vesical and intestinal forms and the intermediate hosts which are *Bulinus mariei* for *Schistosoma haematobium* and *Biomphalaria madagascariensis* for *S. mansoni*. He also discusses the possibility of extension of the disease by irrigation, and suitable control measures.

N. Jones

- 3—CHUNG, H. L. ET AL., 1960. [Research Laboratories of Peking Sino-Soviet Friendship Hospital and Peking People's Hospital, Peking, China.] "Studies on clonorchiasis sinensis in Peking and Tientsin. Occurrence of clonorchiasis sinensis in Peking and its suburbs, with observations on secondary intermediary and definitive hosts." **Science Record. Peking**, New series, **4** (1), 19-25.

In Peking and its suburbs, where occasional cases of clonorchiasis have occurred, all the necessary links for its cycle have been shown to be present. The following fishes from local ponds and rivers were infected (in approximate order of their infection rate): *Pseudorasbora parva*, *Acanthorhodeus taenianalis*, *Culter brevicauda*, *Eleotris* sp., *E. swinhonis*, *Carassius auratus*, *Parapelecus tingchowensis* and *Pseudogobio rivularis*. *Eleotris* as host of *Clonorchis sinensis* is reported for the first time for China. The first intermediaries, *Bithynia fuchsiana* and *B. longicornis*, were present in the infected waters, and of 50 local cats examined 13 were naturally infected with from 36 to 1,593 worms [see also Helm. Abs., **29**, No. 12; **30**, No. 4].

G. I. Pozniak

- 4—CHUNG, H. L. ET AL., 1960. [Research Laboratories of Peking Sino-Soviet Friendship Hospital and Peking People's Hospital, Peking, China.] "Studies on clonorchiasis sinensis in Peking and Tientsin. Occurrence of clonorchiasis sinensis at Palit'ai, Tientsin, with observations on intermediary and definitive hosts." **Science Record, Peking**, New series, 4 (1), 26–32.

A case of *Clonorchis sinensis* is reported for the first time from Palit'ai, Tientsin. The case history shows that the man frequently ate raw fish. Local investigations determined the presence of the snail intermediaries and confirmed infection of fish (*Pseudorasbora parva* dark and white varieties, *Carassius auratus* and *Acanthorhodeus taenianalis*), and of cats (in two out of five). Chung *et al.* predict that the incidence is probably not high among the North Chinese who are not in the habit of eating raw fish, but point out the need for more extensive studies and for medical work.

G. I. Pozniak

- 5—FACEY, R. V. & MARSDEN, P. D., 1960. "Fascioliasis in man: an outbreak in Hampshire." **British Medical Journal**, Year 1960, 2 (5199), 619–625.

Facey & Marsden review the literature of human fascioliasis and describe an outbreak due to *Fasciola hepatica* which occurred in the autumn of 1958 in the Hampshire market town of Ringwood. Six patients were affected, in five of whom diagnosis was confirmed by finding the ova in the faeces. The principal symptoms were prolonged fever, pain in the right hypochondrium sometimes associated with hepatomegaly, asthenia, often urticaria and always high eosinophilia. One case showed anaemia, apparently due to a red cell sensitizing antibody. The infection is believed to have been acquired by eating watercress grown in natural beds, and control of watercress beds in endemic areas is therefore advised. Chloroquine treatment relieved the symptoms but failed to cure. Except in one case, in which emetine was effective, patients refused further therapy.

J. M. Watson

- 6—HARINASUTA, C. & KRUATRACHU, M., 1960. [School of Tropical Medicine and Endemic Diseases, Faculty of Tropical Medicine, Bangkok, Thailand.] "Schistosomiasis in Thailand." [Correspondence.] **Transactions of the Royal Society of Tropical Medicine and Hygiene**, 54 (3), 280–281.

This is the first report of an area of endemic schistosomiasis in Thailand, namely, the Chawang district of Nakorn-Sritharmaraj, one of the southern provinces. The first indication of its existence was the finding of *Schistosoma japonicum* eggs in cancer tissue removed by biopsy from the colon of a patient from the area hospitalized in Bangkok. A first survey, made in August 1959, revealed *S. japonicum* eggs in 7 out of 426 faecal specimens from individuals of all ages. A second survey, made in February 1960, showed positive intradermal reactions in 92 out of 1,529 persons and schistosome eggs in 15 out of 63 rectal biopsies performed on positive skin test cases.

J. M. Watson

- 7—HUNTER, III, G. W., 1960. [Department of Microbiology, University of Florida, College of Medicine, Gainesville, Florida, U.S.A.] "Studies on schistosomiasis. XIII. Schistosome dermatitis in Colorado." **Journal of Parasitology**, 46 (2), 231–234.

Hunter describes an outbreak of schistosome dermatitis among bathers at Grant Lake, Colorado, which he attributes to cercariae of *Trichobilharzia physellae*, then being emitted from *Physa propinqua* in large numbers.

P. Knight

- 8—ITO, M., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Paragonimus westermani* along the Oita River. I. Investigation on the distribution of paragonimiasis along the Oita River.] **Journal of the Kurume Medical Association**, 22 (5), 2121–2131. [In Japanese: English summary pp. 2130–2131.]

7,219 seemingly healthy schoolchildren of the River Oita valley were investigated for *Paragonimus westermani* infection by an intradermal test. 587 positive (8.1%) and 69 doubtful (2.6%) cases were obtained. A sputum examination of these positive and doubtful cases revealed that in the former group 25 cases (6.9%) were positive for ova but only one in the latter group (1.7%). 605 adults from the same area were investigated; this revealed 25 cases (11.4%) with a positive skin reaction. The infection rate with metacercariae was 70.8% in *Eriocheir japonicus* and 2.3% in *Potamon dehaani* in this area.

Y. Yamao

- 9—ITO, M., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Paragonimus westermani* along the Oita River. IV. Investigations on eating fresh-water crabs and subjective symptoms." *Journal of the Kurume Medical Association*, 22 (6), 2393–2401. [In Japanese: English summary p. 2401.]

Among schoolchildren proved positive by the intradermal test for paragonimiasis, a history of tuberculosis or paragonimiasis was prevalent. Also, many complained of coughs, haemoptysis and dizziness. Many of them were found habitually to eat *Eriocheir japonicus*.
Y. Yamao

- 10—NAGAHANA, M., TOYAMA, H. & NISHIDA, H., 1959. [Department of Public Health, Faculty of Medicine, Tottori University, Yonago, Japan.] [On the lung fluke (*Paragonimus westermani*) in San-in District: I. Investigations at Saihaku-cho of Tottori Prefecture on human infections by this worm and on its intermediate host.] *Journal of the Yonago Medical Association*, 10 (1), 209–210. [In Japanese.]

207 schoolchildren and 122 adult residents of the town of Saihaku, Tottori Prefecture (Japan), were investigated for *Paragonimus westermani* by faecal examination. Two positive cases were found in each group. *Eriocheir japonicus* and *Potamon dehaani* were examined and the former was found to have metacercariae of *P. westermani*.
Y. Yamao

- 11—NAGAMOTO, T., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Clonorchis sinensis*. I. The results of *Clonorchis sinensis* investigations along the Onga River.] *Journal of the Kurume Medical Association*, 22 (4), 1384–1398. [In Japanese: English summary pp. 1397–1398.]

Intradermal tests for clonorchiasis were applied to 200 residents around the lower course of the River Onga, especially in and around Nakama City, Fukuoka Prefecture, Kyushu. 70 persons (35%) were positive and nine (0.45%) were doubtful. Of those positive to the skin reaction, 59 were examined for ova and 26 were found positive. Five species of fresh-water fish were examined for metacercariae of *Clonorchis sinensis* and only *Pseudorasbora parva* was found infected, the infection rate being from 86.7% to 100%.
Y. Yamao

- 12—WEI, W. P., 1960. "Battle against schistosomiasis." *Chinese Medical Journal. Peking*, 80 (4), 299–305.

Wei describes the improvements in schistosomiasis, in relation to the working power and economy of the population, said to be achieved by the anti-schistosome campaign organized by the present regime in China.
G. I. Pozniak

- 13—WENG, H. C., CHUNG, H. L., HO, L. Y. & HOU, T. C., 1960. [Peking Sino-Soviet Friendship Hospital, Peking, China.] "Studies on clonorchiasis sinensis in past ten years." *Chinese Medical Journal. Peking*, 80 (5), 441–445.

Weng *et al.* present a brief account of the work done on clonorchiasis in China in the past ten years. Surveys have shown the disease to be more extensively present, especially in Kiangsi, Peking and Tientsin, than was formerly known to be the case; and the life-cycle has been followed through and the identity of the first intermediate hosts established in a number of additional localities. Several further species of fresh-water fish have been found to be second intermediate hosts. In all endemic areas cats and dogs have been confirmed as reservoir hosts. Symptomatology and pathology have received attention. Examination of sediment from centrifuged bile, intradermal tests and the complement fixation reaction have been found valuable in diagnosis. In treatment, chloroquine is the drug of choice, but the long administration schedule and heavy dosage required often produce marked toxic reactions. Combined treatment with emetine is sometimes effective when chloroquine alone has failed or relapse has occurred. Energetic preventive measures have brought the disease under control in many endemic areas.
J. M. Watson

Cestoda

- 14—GALYAMINA, V. D., 1959. [Kafedra infektsionnikh boleznei s epidemiologiei, Kuybyshevskii meditsinski institut, U.S.S.R.] [The influence of *Hymenolepis* infections on the course of chronic dysentery in children.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 28 (6), 733–736. [In Russian.]

The course of chronic dysentery was more severe and lasted longer in 100 children with concomitant *Hymenolepis nana* infection than in 100 control children suffering from dysentery only. Treatment for dysentery was successful in only 10·3% of these children but in 41·9% of the controls; three months after anthelmintic treatment, however, stools became normal in nearly half of the previously worm-infected children. G. I. Pozniak

- 15—HERBSMAN, H., TANAKA, A. M. & STUCKEY, J. H., 1959. [Department of Surgery, State University of New York, Downstate Medical Center, Brooklyn, New York, U.S.A.] "The first case report of an *Echinococcus* liver cyst infected with *Salmonella Saint Paul*." **Annals of Surgery**, 149 (4), 565–571.

Herbsman *et al.* report on a case of liver echinococcosis in a 21-year-old Greek immigrant. Operative procedures, including evacuation, formalin instillation and catheter drainage are discussed in detail. Analysis of material removed from the cyst revealed hooklets and Gram-negative organisms which were cultured and found to be *Salmonella St. Paul*. G. A. Webster

- 16—IZAKI, S., 1957. [Department of Surgery, Tottori University School of Medicine, Yonago, Japan.] [A case of subcutaneous tumour formation caused by *Sparganum mansonii* in the human body.] **Journal of the Yonago Medical Association**, 8 (1), 82–85. [In Japanese.]

Sparganum mansonii (the plerocercoid of *Diphyllbothrium mansonii*) about 9 cm. long was found in a tumour which was surgically removed from the left thigh of a woman in Tottori Prefecture. Y. Yamao

- 17—JIMÉNEZ-QUIRÓS, O., 1959. [Cátedra de Helminología, Facultad de Microbiología y Sección de Salud del D.B.O. de la Universidad de Costa Rica.] "Difentano-70: tratamiento electivo en himenolepiasis nana." **Revista de Biología Tropical. Universidad de Costa Rica**, 7 (1), 75–80. [English summary pp. 79–80.]

According to official statistics in Costa Rica a 5·1% *Hymenolepis nana* infection rate was found in over 120,000 faecal examinations. The author treated 20 patients, students at the State University, with two 0·5 gm. tablets of diphenanthene-70, three times a day after meals for five days; this was repeated for two other cycles at 10-day intervals, i.e. 90 tablets in 35 days in all. Seven weeks after the last treatment all but two patients were negative for the infection. Side effects, seen in eight patients, included intestinal colic, transient diarrhoea and urticaria. W. K. Dunscombe

- 18—McCONCHIE, I., 1958. "Hepato-pulmonary hydatid disease." **Australian and New Zealand Journal of Surgery**, 27 (3), 204–210.

McConchie records seven case histories, illustrating the clinical picture and surgical treatment of five types of hepato-thoracic hydatid in man. M. A. Gemmell

- 19—MICHON, P., 1958. [Laboratory of Pathological Anatomy, Faculty of Medicine, Nancy, France.] "Données actuelles sur l'échinococcose alvéolaire." **Bulletin de l'Académie Nationale de Médecine. Paris**, 3e série, 142 (33/34), 941–944.

Since seven cases of alveolar echinococcosis have been reported from Lorraine in the last nine years, Michon feels that there is a slow geographical extension of the disease which already requires attention. His paper deals briefly with diagnosis, biology of the parasite, nature of the lesions and therapeutics. G. A. Webster

- 20—PRADATSUNDARASAR, A., 1960. [Department of Pathology, Chulalongkorn Medical School, Bangkok, Thailand.] "Nine cases of *Raillietina* infection in Bangkok." **Journal of the Medical Association of Thailand**, 43 (1), 56–58.

The author refers to the three previous records of human infection with *Raillietina siriraji* in Thailand and reports six additional cases. Seven out of the nine cases were children not more

than three years old. Two of the six new cases gave a history of putting a cockroach in their mouths. The author believes, on general epidemiological grounds, that *Rattus norvegicus* is the definitive host and cockroaches the intermediate hosts of this tapeworm, and that human infection is caused by accidental ingestion of infected roaches.

J. M. Watson

Acanthocephala

No relevant abstracts in this issue

Nematoda

21—ATÍAS, A., PESSE, N. & ALVAREZ, R., 1960. [Servicio de Pediatría y Asesoría de Parasitología Clínica, Hospital San Juan de Dios, Santiago, Chile.] "Tres casos de tricocéfaloosis masivas tratados con ditiазanina." *Boletín Chileno de Parasitología*, **15** (1), 12-15. [English summary p. 12.] The main symptoms in the three cases described, all of which were young children, were anaemia, dysentery and geophagia. In addition to the massive infection with *Trichuris trichiura*, *Ascaris lumbricoides* was also present. Rapid recovery followed treatment with 300 mg. of dithiazanine daily for five or six days.

J. M. Watson

22—EDESON, J. F. B., WILSON, T., WHARTON, R. H. & LAING, A. B. G., 1960. [Institute for Medical Research, Kuala Lumpur, Federation of Malaya.] "Experimental transmission of *Brugia malayi* and *B. pahangi* to man." *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **54** (3), 229-234.

Four human volunteers (A, B, C and D) were used for experimental inoculation with infective larvae of *Brugia malayi* (A, B) and *B. pahangi* (C, D). The *malayi* strain was originally from man and had been transmitted through a macaque monkey and thence to a cat. Neither A nor B subsequently developed microfilariae. The *pahangi* strain was from a domesticated cat previously infected from a naturally infected civet cat. Volunteer C developed microfilariae 84 days after inoculation and maintained them in small numbers for eight weeks. Their identity as *B. pahangi* was later confirmed experimentally. Volunteer D remained negative. About a month after inoculation all the volunteers were affected with lymphangitis, lymphadenitis and oedema of the inoculated limb (the left arm) and in 12 to 13 weeks they had eosinophilia of 18% to 32% but no leucocytosis. About four months after inoculation B and D developed subcutaneous nodules in the inoculated arm. All four showed positive complement fixation tests and skin tests to *Dirofilaria* antigen. "*B. pahangi* must now be regarded as potentially infective to man. The clinical episodes are considered to be reactions to the immature developing worms, whereas the eosinophilia is more probably a response to some product of the adult worms. Subcutaneous nodules do not seem to have been described previously in association with filarial infection."

J. J. C. Buckley

23—FERGUSON, A. G. & LOGAN, J. C. P., 1957. [Department of Dermatology, Stobhill General Hospital, Glasgow, Scotland.] "Onchocerciasis: a review of five cases treated in Britain with diethylcarbamazine." *Australian Journal of Dermatology*, **4** (1), 5-10.

Ferguson & Logan describe five cases of onchocerciasis, comprising four Europeans in whom diagnosis was presumptive and one African in whom it was fully confirmed. These cases were successfully treated with diethylcarbamazine, the patients remaining symptom-free over periods of between one and seven years. The authors stress that nodule formation is rare in members of the white races although the disease itself may be commoner among them than is generally supposed; and that the recognition of certain non-specific symptoms and clinical signs is important in diagnosis.

J. M. Watson

24—JIMÉNEZ-QUIRÓS, O., 1959. [Cátedra de Helmintología, Facultad de Microbiología y Sección de Salud del D.B.O., Universidad de Costa Rica.] "Ascariasis con manifestaciones nerviosas y eosinofilia del liquor." *Revista de Biología Tropical. Universidad de Costa Rica*, **7** (1), 67-74. [English summary p. 73.]

A 16-year-old girl was admitted to hospital suffering from mental inco-ordination; a lumbar puncture revealed pleocytosis with 8% eosinophils, and ova of *Ascaris*, *Ancylostoma duodenale*

and *Trichuris trichiura* were found in the faeces. In view of the history of previous attacks characterized by loss of consciousness and headaches, the diagnosis was allergic meningeal angioneurotic manifestations due to ascariasis. After treatment, even six months later 14% eosinophils were found in the blood films but no *Ascaris* ova were seen. The eosinophilia in the cerebrospinal fluid is regarded as a manifestation of allergic shock produced by a specific allergen (*Ascaris*) on a background of hereditary predisposition. W. K. Dunscombe

- 25—KAWAGOE, K., NISHI, H., SHIBATA, E. & YAMADA, S., 1958. [Public Health Bureau, Osaka City, Osaka, Japan.] [On the effect of night-soil treatment by heating process utilizing surplus midnight electric power upon the incidence of parasitic infection of farmers.] **Japanese Journal of the Nation's Health**, 27 (3), 162-165. [In Japanese: English summary p. 162.]

In a farm village in Osaka City, the night-soil treated by a heating process utilizing surplus midnight electric power, was used as a fertilizer for the farm. Observation for eight months, during which there was no mass administration of anthelmintics, showed a decline in the prevalence rates of parasite infection, although it was not very marked. In the second observation, however, in which the mass administration of anthelmintics was carried out twice, the prevalence rates were remarkably reduced (hookworm from 52% to 11%, *Ascaris* from 33% to 12%), and remained at a very low level throughout the observation period of five months. According to these results, a combined application of night-soil treatment and mass administration of anthelmintics was regarded as the most effective method of preventing parasite diseases.

Y. Yamao

- 26—HSIEH, S. C., LIU, Y. K. & JOHN, L., 1960. [Shanghai First Medical College, Shanghai, China.] "Single dose hetrazan treatment of filariasis." **Chinese Medical Journal. Peking**, 80 (2), 166-169.

Hetrazan as a single dose is convenient and rapid for the mass treatment of filariasis. In the Kiangsu province, a dose of 1 gm. per person resulted in negative blood tests for 82.8% of 186 persons with *Wuchereria malayi* and for 60.4% of 1,052 with *W. bancrofti*. The efficacy achieved depended on the initial intensity of infection and in persisting cases a second treatment was successfully applied. A drawback of this method is the appearance of nausea and vomiting, but these were not severe. Other side reactions tended to be more frequent in cases of *W. malayi* than of *W. bancrofti*.

G. I. Pozniak

- 27—HUANG, W. H., KAO, C. T., HSU, M. C. & HUANG, C. C., 1958. [Department of Parasitology, College of Medicine, National Taiwan University, Taiwan.] [Observations on hookworm disease among coal miners in Taiwan. II. A pre-treatment survey of intestinal parasite infections in the workers of coal mines; especially of the intensity of hookworm infection.] **Journal of the Formosan Medical Association**, 57 (11), 710-735. [In Chinese: English summary pp. 731-735.]

Huang *et al.* examined the faeces of 1,317 mine workers and found four species of protozoa and eight species of helminths. 1,095 (83.1%) of the mine workers were infected with hookworms. Underground workers had a slightly higher incidence of infection than surface workers. Egg counts showed low intensities of infection. It is believed that miners with moderate or heavy infections are unable to endure heavy labour and of their own accord changed their occupation.

L. S. Yeh

- 28—MAZZOTTI, L., 1959. [Instituto de Salubridad y Enfermedades Tropicales, Mexico.] "Salida de hembras parásitas adultas de *Strongyloides stercoralis* con las materias fecales de pacientes tratados con dithiazanina." **Revista del Instituto de Salubridad y Enfermedades Tropicales. Mexico**, 19 (2), 123-127. [English summary p. 127.]

Four patients were treated for *Strongyloides stercoralis* infection with daily doses of 300 mg. to 600 mg. of dithiazanine for five to seven days. The number of *S. stercoralis* females found in the faeces during the first two to nine days ranged from three to 1,292 per patient. No embryonated eggs were found in the uteri of the females.

N. Jones

- 29—OGAWA, H., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Studies on enterobiasis. 1. Survey of children in three kindergartens, a primary school and of women visiting a gynaecological clinic in Ashikaga City on enterobiasis, with the results of mass treatment with piperazine.] **Japanese Journal of Parasitology**, 8 (4), 616-620. [In Japanese.] Residents in Ashikaga City, Tochigi Prefecture were examined for pinworm eggs, using a single Scotch tape technique. The infection rate was 43.4% for kindergarten children and 34.1%

for third-year schoolchildren. The calculated infection rate of triple successive examinations, estimated from these data, was 62% for kindergarten children and 49% for schoolchildren. Out-patients, who came to a gynaecological clinic, showed an infection rate of less than 10% for patients under 25 years of age. It showed a sudden increase in the 26 to 36-year-old age group, reaching its peak in the 36 to 40-year-old group and decreasing gradually among older people. The infection rate in adults showed a high correlation with the occurrence of infection in their children and also with the number of children they had. When piperazine was given, in tablet form, 50–75 mg. per kg. body-weight at a time for seven successive days, 84.4% of the carriers became negative, whereas when the drug was administered in a syrup 81.6% of them became negative. Y. Yamao

- 30—OKADA, K., 1959. [Department of Clinical Research, Institute for Infectious Disease, University of Tokyo, Tokyo, Japan.] [Fundamental studies on the anthelmintic effect on *Ascaris*. 3. Practical evidence of the rate of false negative case for ova by Komiya using the T.M. reaction of faeces.] **Japanese Journal of Parasitology**, 8 (4), 633–636. [In Japanese: English summary pp. 635–636.]

Mass treatment against *Ascaris lumbricoides* was given to residents of a town near Tokyo. Some of them showed a positive T.M. reaction while their faeces were negative for *Ascaris* eggs. This group comprised 7.5% of the 173 carriers treated, and at least 4.7% of them were proved to have *Ascaris* by further examination. Before the treatment, 208 persons were found to have a positive T.M. reaction, among whom 10.0% were still positive for the T.M. reaction although no eggs were found in their faeces after the treatment. At least 6.5% of those were considered to harbour *Ascaris*. Y. Yamao

- 31—SASA, M. ET AL., 1959. [Department of Parasitology, Institute of Infectious Diseases, University of Tokyo, Tokyo, Japan.] [Studies on the control of bancroftian filariasis in Amami Oshima Island.] **Japanese Journal of Parasitology**, 8 (6), 872–879. [In Japanese: English summary p. 879.]

A field study on group control of filariasis was made at four villages on Amami Oshima Island to the south of Japan. The rate of infection with microfilariae was 11.8% to 30.2%. The best result in mass treatment with diethylcarbamazine was obtained with the following regime: initial doses of 2 mg. per kg. body-weight for five days followed by maintenance doses of 2 mg. per kg. every 10 days, and 2 mg. per kg. per day for five days followed by 2 mg. per kg. per day every 10 days repeated 10 times in five months. After four months observation, the infection rate with microfilariae was 0.78% to 18.03%. The residual effect of spraying with 5% D.D.T. emulsion or 0.5% dieldrin emulsion was quite satisfactory in controlling the vector, at least for several months, when walls were sprayed at 50 c.c. per square metre over the whole community. However, a considerable increase of house-flies occurred a few months later while the numbers of other insect pests remained low. Y. Yamao

- 32—SATO, Y., 1959. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [*Ascaris* infection of infants.] **Igaku Kenkyu. Fukuoka**, 29 (6), 1686–1692. [In Japanese: English summary p. 1692.]

164 infants aged from one month to two years, were examined monthly for *Ascaris* to investigate the primary infection by the worm and other related factors. Primary infection was not seen until four to five months after birth. The infection rate was highest among milk-fed infants, next in mixed-fed ones, and lowest among breast-fed babies. Sato suspected that the food, vessels and fingers which were contaminated by *Ascaris* eggs in the dust were responsible. Y. Yamao

- 33—URABE, K., 1957. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [Human experiment on percutaneous infection of *Ascaris*.] **Igaku Kenkyu. Fukuoka**, 27 (12), 3267–3271. [In Japanese: English summary p. 3271.]

About 1,000 hatched larvae of *Ascaris lumbricoides* were smeared on the inner side of the left forearm of a volunteer, the site being slightly scarified beforehand. Afterwards, intense itching, heavy erythema and papules appeared. On the 79th day after the smearing, unfertilized *Ascaris* eggs, about 1,200 e.p.g., were detected in the faeces. Urabe concludes that this experiment proved the possibility of percutaneous infection by *Ascaris* larvae, if there were microscopic wounds. There was, however, no probability that it would occur naturally. Y. Yamao

- 34—WANG, C. F. & LAN, Y. F., 1960. [Department of Medicine, Fukien Medical College, Foochow, Fukien, China.] "Successful hetrazan treatment of tropical eosinophilia, with a discussion on the filarial origin of the disease." **Chinese Medical Journal. Peking**, 80 (3), 248-251.

Wang & Lan report on five cases of tropical eosinophilia successfully treated with hetrazan. The dosage varied from 100 mg. four times daily for seven days in a boy aged 14 years, to 200 mg. three times daily for 14 days in a woman aged 29. Hetrazan is a less toxic and therapeutically more effective drug than arsenicals. The authors list in favour of the filarial aetiology of tropical eosinophilia the similar geographical distribution and age and sex incidence of the two diseases, the presence of allergy and the fact that both conditions respond to the same drug.

G. I. Pozniak

- 35—WEINER, D., 1960. [U.S. Public Health Service, Division of Special Health Services, Washington 25, D.C., U.S.A.] "Larva migrans." **Veterinary Medicine**, 55 (8), 38-40, 45-50.

Weiner reviews current knowledge on cutaneous and visceral larva migrans, its causative agents and the diagnosis and distribution.

G. I. Pozniak

- 36—YAMASHITA, M., 1959. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [An epidemiological study of hookworms in Southern Kyushu.] **Igaku Kenkyu. Fukuoka**, 29 (6), 1953-1968. [In Japanese: English summary p. 1968.]

The epidemiology of *Ancylostoma duodenale* and *Necator americanus* was studied from 1955 to 1959 among residents of 18 villages of Miyazaki Prefecture, Kyushu. Over-all infection rate by hookworms was 51.4%, infection by *A. duodenale* being 29.8%. The average number of worms of this species expelled by the administration of anthelmintics was 6.5, whereas the infection rate with *N. americanus* was 45.7% and the average number of worms expelled was 31.3. In lower humid districts, *N. americanus* was relatively predominant, while in mountainous regions more cases of *A. duodenale* were seen. Yamashita's supposition, which was reported earlier, that *A. duodenale* would infect by mouth and *N. americanus* through the skin, seemed to coincide well with the findings of this study.

Y. Yamao

Nematomorpha

No relevant abstracts in this issue

Hirudinea

No relevant abstracts in this issue

Pentastomida

- 37—GAST-GALVIS, A., 1960. [Instituto "Carlos Finlay", Bogotá, Colombia.] "*Linguatula serrata* en un hígado humano." **Boletín Chileno de Parasitología**, 15 (1), 15-16. [English summary p. 15.]

Gast-Galvis recovered *Linguatula serrata* by hepatic viscerotomy from the liver of an undernourished three-year-old girl from Samaná, Department of Caldas, Colombia. This is the first report of the occurrence of this parasite in man in Colombia. Presenting symptoms included diarrhoea, epigastric pain and excessive thirst, but heavy infection with *Ascaris*, *Trichuris* and *Ancylostoma* was concurrently present.

J. M. Watson

- 38—LE CORROLLER, Y. & PIERRE, J. L., 1959. "Sur un cas de linguatulose humaine au Maroc." **Bulletin de la Société de Pathologie Exotique**, 52 (6), 730-733.

Le Corroller & Pierre report the case of an adult male aged 40 years who presented himself to the Provincial Medical Service in Casablanca complaining of pain in the region of the maxillary sinus and purulent nasal discharge containing white vermiform larvae which were identified as nymphs of *Linguatula serrata*. Biopsy revealed sclero-inflammatory lesions of the sinus mucosa but no parasites. Adult worms were not present. Cure was effected by two

curettages at one month's interval. The status of the human host is discussed and it is concluded that the patient in this instance was a secondary host in whom the localization of the larvae was atypical. The source of the infection was not elucidated. J. M. Watson

Miscellaneous

39—CHANG, Y. C., 1960. [Department of Neurology, Shanghai First Medical College, Shanghai, China.] "Parasitic infestations of the brain." **Chinese Medical Journal, Peking**, 80 (2), 121-126. Chang gives a summarized review of the cases of cerebral parasitic infection reported from China within the last 15 to 20 years. About 348 cases of paragonimiasis, 57 of schistosomiasis and 89 of cysticerciasis have been described. G. I. Pozniak

40—FENG, L. C., MAO, S. P. & LIU, E. H., 1960. [Institute of Parasitic Diseases, Chinese Academy of Medical Sciences, Shanghai, China.] "Research on parasitic diseases in New China." **Chinese Medical Journal, Peking**, 80 (1), 1-20.

Feng *et al.* describe the advances which have been made in knowledge and control of parasitic diseases in China by means of nation-wide investigation during the past decade, with particular reference to geographical distribution, epidemiology, clinical aspects (symptomatology, pathogenesis and diagnosis) and control. In addition to the three major helminth diseases—schistosomiasis, filariasis and hookworm disease—useful progress has been made in knowledge of paragonimiasis, clonorchiasis, ascariasis, enterobiasis and tapeworm infection. J. M. Watson

VETERINARY HELMINTHOLOGY

Horses, Donkeys and Mules

41—FUNNIKOVA, S. V., 1959. [Otdel gelmintologii, Kazanski nauchno-issledovatel'ski veterinarni institut, U.S.S.R.] [Diagnosis of *Setaria equina* infection in horses.] **Trudi Kazanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, No. 13, pp. 403-413. [In Russian.]

172 horses were used in experiments on the diagnosis of setariasis. *Setaria equina* obtained *in vitro* and from equine blood were studied, and the following conclusions reached: (i) *S. equina* gives birth to live, fully formed larvae still enclosed within the egg membrane (ii) microsetariae presumably find their way into the blood stream via the lymphatic system (iii) the sheath (egg membrane) is shed in the blood after the larvae have reached a certain stage of development; (iv) diagnosis of setariasis during life can be made by examination of the blood for larvae after lysis of the erythrocytes in distilled water and centrifuging.

N. Jones

42—FUNNIKOVA, S. V., 1959. [Otdel Gelmintologii, Kazanski Nauchno-Issledovatel'ski Veterinarni Institut, U.S.S.R.] [A case of setariasis of the abdominal cavity in the horse.] **Trudi Kazanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, No. 13, pp. 425-427. [In Russian.]

Funnikova describes the clinical and anatomo-pathological aspects of setariasis in a horse. 276 *Setaria equina* were recovered from the abdominal cavity. The animal was also infected with *Parascaris equorum* and strongylids. N. Jones

43—ISHIHARA, T. & UENO, H., 1958. [National Institute of Animal Health, Kodaira, Tokyo, Japan.] [Studies on summer mange ('kasen disease') of the horse in Japan. VI. Etiological study of nematodes of filaria, especially *Onchocerca cervicalis*.] **Bulletin of the National Institute of Animal Health, Tokyo**, No. 35, pp. 161-178. [In Japanese: English summary pp. 173-174.]

Filariae of the genus *Setaria* were rarely observed in the blood-stream of the cutaneous tissue of horses affected with summer mange ('kasen disease'). Microfilariae obtained from the cutaneous tissue were all identified as those of *Onchocerca cervicalis* (synonym *O. reticulata*). There was no significant difference between the diseased and healthy horses in the number of microfilariae parasitic in the skin. When the horse had neither the microfilariae nor adults

of *O. cervicalis*, it could still be proved to be suffering from this disease. Artificial induction of the disease was successful in the horses without filariae by insects and allergen from blood-sucking insects. Microfilariae in the skin were not the cause of this disease, even taking histopathological findings and effects of treatment into consideration. Ishihara & Ueno state that, in most cases, *O. cervicalis* was not the cause of summer mange of horses. Y. Yamao

44—POYNTER, D., 1958. "The horse and its helminths." **Journal of the Royal Army Veterinary Corps**, 29 (3), 153-156.

Poynter, after briefly summarizing historical data on equine helminthiasis, quotes more recent literature on this subject. A table is given indicating that the efficacy of phenothiazine on the large strongyles of horses in Britain is diminishing. The efficacy of a 30 gm. to 35 gm. dose fell from 85.9% in 1942 to 14.9% in 1958 but different workers have tested the drug in different years. N. Jones

45—RAI, P., 1960. [Department of Parasitology, U.P. College of Veterinary Science and Animal Husbandry, Mathura, India.] "Studies on some helminth parasites of local equines." **Indian Journal of Helminthology**, Year 1958, 10 (2), 97-110.

Rai has examined 86 ponies and 10 donkeys in India and as a result lists 38 species of helminths, naming the localities of their occurrence and, where applicable, the authors of previous records from India. *Schistosoma spindale*, *Probstmayria vivipara*, *Craterostomum tenuicauda*, *Trichonema (Cylicocercus) alveatum* and *Trichostrongylus axei* are marked as first records for India. Useful additional data on the morphology, localization, etc. of *S. spindale*, *Dictyocaulus arnfieldi*, *Gongylonema pulchrum* and *Setaria equina* were obtained and are reported here. [See also abstracts of preliminary reports Helm. Abs., 27, No. 226f and 29, No. 1142.] G. I. Pozniak

46—RAO, T. A., 1959. "Equine strongyloidosis." **Madras Veterinary College Annual**, 17, 45-48. Rao gives a very general account, including prophylaxis and treatment, of strongyles in equines. S. Willmott

47—VERGANI S., F., 1959. "Un caso de quiste hidatídico en un equino de Venezuela." **Boletín del Instituto de Investigaciones Veterinarias**. Caracas, Year 1958-59, 10/11 (26), 41-44.

Vergani reports on the finding of a hydatid cyst in an equine [whether horse, mule or donkey is not stated], which is the first host record in Venezuela. The cyst, which was situated in the liver, was of unilocular form. The paper is illustrated with photomicrographs. N. Jones

48—VRAŽIĆ, O. & RIJAVEC, M., 1960. [Institut za veterinarsko medicinska istraživanja, Zagreb, Yugoslavia.] "Prilog poznavanju parastiske faune magarca (*Equus asinus* L.)." **Veterinarski Arhiv**, 30 (5/6), 128-133. [English and German summaries pp. 131-133.]

Vražić & Rijavec carried out post-mortem examinations of 82 donkeys, coming from three districts of Croatia. Following these studies *Trichonema aegyptiacum* (in 17.07% of the animals), *Cylicocyclus auriculatum* (17.07%) and *Poteriostomum skrjabini* (13.41%) have been recorded for the first time in Yugoslavia. The other helminths found were: *Dicrocoelium dendriticum* (2.4%), *Fasciola hepatica* (8.5%), *Parascaris equorum* (14.4%), *Oxyuris equi*, *Setaria equina* (23.1%), *Habronema megastoma* (3.5%), *H. microstoma* (10.9%), *Gongylonema pulchrum* (26.7%), *Strongylus equinus*, *Delafondia vulgaris*, *Triodontophorus serratus*, *Trichonema longibursatum*, *T. calicatum*, *T. catinatum*, *T. coronatum*, *T. labiatum*, *T. labratum*, *Cylicocyclus elongatum*, *C. nassatum*, *Cylicodontophorus bicornatum*, *C. pateratum*, *Petrovinema poculatum* and *Dictyocaulus arnfieldi* (3.6%). N. Jones

Cattle

49—ALICATA, J. E., 1960. [Dept. of Parasitology, Hawaii Agricultural Experiment Station, University of Hawaii, Honolulu, Hawaii.] "Incidence of parasites in calves in Hawaii and the treatment of *Cooperia punctata*, with special reference to the efficacy of Ruelene." **American Journal of Veterinary Research**, 21 (82), 410-415.

A survey of the incidence of the worms causing unthriftiness in calves in the Hawaiian group of islands revealed that *Cooperia punctata* was more frequently present, and in greater numbers,

than any other helminth, particularly in high rainfall areas. Of anthelmintics tested, toluene and phenothiazine were ineffective, piperazine citrate (at 10.8 gm. to 15.0 gm. piperazine per 100 lb. body-weight) was 81% to 92% effective, piperazine dihydrochloride (at 15.0 gm. to 20.0 gm. piperazine per 100 lb.) was 54% to 88% effective, ronnel (at 5.0 gm. per 100 lb.) was 80% effective, Bayer L13/59 (at 3.0 gm. per 100 lb.) was 89% effective, and Ruelene (at 1.76 gm. per 100 lb.) was 99.7% effective. Ruelene is 4-tert. butyl-2-chlorophenyl methyl methylphosphoramidate. The desirability of evaluating the toxic risks of the organic phosphate compounds before definite recommendations are made, is stressed. P. L. Thomas

50—BAKER, N. F., DOUGLAS, J. R., CRENSHAW, G. L. & SMITH, E. M., 1960. [School of Veterinary Medicine, University of California, Davis, California, U.S.A.] "Treatment of acute clinical gastrointestinal parasitism." **Veterinary Medicine**, 55 (8), 73-75.

Yearling feeder steers suffering from acute clinical infection with *Trichostrongylus* and *Ostertagia* which failed to respond to phenothiazine therapy, received by stomach tube 20 mg. of Bayer 21/199 per kg. body-weight (eight animals) or 100 mg. of Dowco-105 per kg. (eight animals). 39 days later, these and six untreated controls received a further 100 mg. of Dowco-105. The treatment resulted in a considerable reduction in egg counts and in the restoration of weight gains. Only two animals failed to respond. Two from the first group died due to the severity of the disease and phosphate toxicity. A further 63 animals were satisfactorily treated on pasture with Bayer 21/199; of these one died and two required atropine therapy. The two compounds, due to the small margin between the therapeutic and toxic doses, are not considered suitable for wide-spread use. G. I. Pozniak

51—BAXTER, J. T., 1960. [Department of Clinical Veterinary Practice, School of Veterinary Medicine, Trinity College, Dublin, Eire.] "Inclusion body pneumonia of cattle." [Correspondence.] **Veterinary Record**, 72 (22), 437-438.

Inclusion body pneumonia of cattle may clinically simulate parasitic bronchitis but cases occur in the absence of *Dictyocaulus viviparus*. H. McL. Gordon

52—DAVIS, L. R., HERLICH, H. & BOWMAN, G. W., 1960. [Regional Animal Disease Research Laboratory, Agricultural Research Service, U.S. Dept. of Agriculture, Auburn, Alabama, U.S.A.] "Studies on experimental concurrent infections of dairy calves with coccidia and nematodes. III. *Eimeria* spp. and the threadworm, *Strongyloides papillosus*." **American Journal of Veterinary Research**, 21 (81), 181-187.

Concurrent infections of young calves with coccidia (*Eimeria* spp.) and a nematode, *Strongyloides papillosus* were no more deleterious than infections with the individual species. Higher oocyst counts were recorded in the mixed infections as damage to the intestinal wall by the nematode may have permitted greater penetration and development of the coccidia. The surviving calves were more resistant to subsequent reinfection with the same species when compared with the results of the original infections. R. F. Riek

53—DAVIS, L. R., HERLICH, H. & BOWMAN, G. W., 1960. [Regional Animal Disease Research Laboratory, Agricultural Research Service, U.S. Dept. of Agriculture, Auburn, Alabama, U.S.A.] "Studies on experimental concurrent infections of dairy calves with coccidia and nematodes. IV. *Eimeria* spp. and the small hairworm, *Trichostrongylus colubriformis*." **American Journal of Veterinary Research**, 21 (81), 188-194.

Concurrent infections of young calves with *Eimeria* spp. and *Trichostrongylus colubriformis* were more destructive than the coccidia alone. Calves given mixed infections in which the initial dose of oocysts was half that given to the group with coccidia only, had higher oocyst counts, made poorest total weight gains, and had diarrhoea on more days than the group with coccidia only. R. F. Riek

54—FROYD, G., 1959. [Veterinary Research Laboratory, Kabete, Kenya.] "The incidence of liver fluke and gastro-intestinal parasites of cattle in Kenya." **Bulletin of Epizootic Diseases of Africa**, 7 (2), 179-182. [French summary p. 12.]

In a survey of 1,000 slaughtered cattle from European farms and African pastoral areas of Kenya, Froyd examined livers for the presence of fluke and single faeces samples for ova of stomach flukes, nematodes and cestodes and oocysts of coccidia. The incidence of *Fasciola*

gigantica was 35.4%, paramphistomes 53.8%, nematodes 42.8%, cestodes 2.8%, and coccidia 7.1%. This represented 62.3%, 95.8%, 89.3%, 15.6% and 33.6% of the farms from which stock was seen. Liver-fluke eggs were not found in 38.5% of animals in which the parasites were observed in the livers. G. Froyd

- 55—GADZHIEV, K. S., 1957. [Epizootiology and control of neosarcariasis in calves and young buffaloes.] *Trudi Azerbaidzhanskoi Nauchno-Issledovatel'skoi Veterinarnoi Opitnoi Stantsii*, 6, 61-72. [In Russian.]

Neosarcariasis is wide-spread among calves in the mountainous and foot-hill areas of the Azerbaidzhan S.S.R. Young buffaloes are also affected. The infection attacks animals aged 17 days to three months. For its treatment, santonin in single doses of 0.02 gm. per kg. body-weight and hexachlorethane in two doses of 0.2 gm. per kg. body-weight with a ten-day interval, proved useful, giving a cure rate of 80% to 85%. Phenothiazine in doses of 0.3 gm. per kg. was ineffective while 3 gm. of tartar emetic per animal proved unsuitable. G. I. Pozniak

- 56—GRÉTILLAT, S., 1957. [Laboratoire central de l'Élevage et des Épipzooties, Service de Parasitologie, Tananarive, Madagascar.] "Note préliminaire sur la gastrothylose des jeunes zébus à Madagascar." *Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux*, 10 (3), 221-230. [English summary p. 230.]

Grétilat discusses paramphistomiasis, due to *Carmyerius dollfusi*, in zebu calves in Madagascar and describes the symptomatology, lesions observed post mortem, diagnosis, prognosis and prophylaxis. He gives details of *in vitro* tests with various anthelmintics against *C. dollfusi*; Verbutane (dichlorobutane-chlorobutene mixture) killed all the worms within five minutes. 27 zebu calves, all emaciated and with chronic diarrhoea and 21 of which had demonstrably massive infections of *C. dollfusi* were then dosed with this compound. The dose rate was 20 ml. to 45 ml. of the pure product for animals weighing 70 kg. to 150 kg., taking into account the general state of the calves. Faecal examinations one week and one month after treatment showed it to have been very effective and there was a gradual amelioration of the symptoms. These results were confirmed by post-mortem examinations of two of the calves. There are brief notes on the morphology of the egg of *C. dollfusi* and on the daily rhythm of egg-laying. S. Willmott

- 57—LEDERMAN, F., 1958. [Vétérinaire de Zone a Walungu, District Sud-Kivu, Belgian Congo.] "La distomatose bovine dans les régions du Sud-Kivu, Congo Belge." *Bulletin de l'Office International des Épipzooties*, 50, 385-421.

A high proportion of cattle in the Walungu area of South Kivu, Belgian Congo, are infected with *Fasciola hepatica*. This is favoured by the prevalence of swamps, streams, and a warm humid climate suitable for the intermediate host and development of the parasite's ova. The native owners rely upon swamp grazing during the dry season. Lederman believes that stock develop considerable tolerance to this parasite and if removed from contact will free themselves in one or two years. The condition was not previously diagnosed due to difficulties in finding ova in the faeces, but Lederman found *Fasciola* ova in 70% to 100% of the stock. In view of the primitive husbandry, preventive measures were not considered practicable and large scale therapy was undertaken. Favourable reports on carbon tetrachloride in oil, subcutaneously, were adopted but trials proved it completely ineffective at doses up to 15 c.c. of carbon tetrachloride in 45 c.c. arachis oil, live flukes being found at autopsy. The same treatment by mouth in doses up to 8 c.c. carbon tetrachloride in 24 c.c. arachis oil was equally ineffective. A variety of drugs was then tried, namely, turpentine-benzol by mouth and intra-ruinally, acriflavine by mouth, methylene blue intravenously and atebine by mouth, all of which were useless. Only hexachlorethane by mouth gave good results and the recommended dose is 175 mg. per kg. body-weight. This may exceed the makers' limit of 60 gm. but the author cannot accept this if complete expulsion of the parasite is required. Lederman dismisses all field control measures as impracticable and concentrates upon the fluke itself in the host as the main target for attack. There is no seasonal climatic influence and therefore no special time for treatment but it is usually advisable to treat in the dry season when ova in faeces are destroyed by the sun. Treatment should be three times per year; at the end of the dry season, at the end of the rains and, finally, when convenient. T. J. Coyle

- 58—MASILLAMONY, R. & SOURI, B. N., 1959. "A case of filariasis in bovines." **Madras Veterinary College Annual**, 17, 30–33.

The authors present the case history of a six-year-old bullock with filariasis. The microfilariae showed diurnal periodicity. The animal had apparently been having fits for ten days. Antimosan, given at the rate of 30 c.c. subcutaneously three times at three-day intervals, effected a complete cure.
S. Willmott

- 59—MEYER, M. C., 1959. [University of Maine, U.S.A.] "Another unusual case of erratic hirudiniasis." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 39.

- 60—SLEITH, F. St. G., 1959. [Veterinary College of Ireland, Ballsbridge, Dublin, Republic of Ireland.] "Some aspects of fluke, hoose and parasitic gastro-enteritis in cattle." **Irish Veterinary Journal**, 13 (12), 222–239. [Discussion 1960, 14 (1), 2–9; (2), 22–26.]

Sleith, in this paper which was presented to a meeting of the Veterinary Medical Association of Ireland, discusses the ecology of the causal parasites, and the epidemiology and methods of control and treatment of fascioliasis hepatica, hoose or dictyocauliasis and parasitic gastro-enteritis in cattle. A report of the open discussion which followed this paper is also included.
C. Hatch

- 61—SUPPERER, R., 1957. [Tierärztliche Hochschule, Wien, Austria.] "Magie im Dienste der Behandlung einer Wurmkrankheit der Rinder—ein alter alpiner Brauch." **Wiener Tierärztliche Monatsschrift**, 44 (8), 475–478. [English, French & Italian summaries p. 478.]

Supperer describes the magic practices against *Bunostomum phlebotomum* infections in cattle which were in common use a few decades ago among the scattered population of the Austrian Alps.
G. I. Pozniak

Sheep and Goats

- 62—DARSKI, J., 1959. [Zakład Parazytologii, Instytut Weterynarii, Puławy, Poland.] "Wpływ małych dawek fenotiazyny na larwy nicieni płucnych znajdujące się w przewodzie pokarmowym owiec." **Acta Parasitologica Polonica**, 7 (23/35), 521–526. [English summary p. 526.]

Treatment of 43 sheep with small daily doses of 1 gm. of phenothiazine in aqueous suspension, given by probe for seven days, reduced the number of lungworm larvae passed in the faeces by 51·03% for *Protostrongylus rufescens*, 50·38% for *Dictyocaulus filaria* and 55·04% for *Muellerius capillaris*. On discontinuation of dosing for three to four days, the number of larvae returned to its original value.
G. I. Pozniak

- 63—FUNNIKOVA, S. V. & KUZNETSOV, V. G., 1959. [Otdel gelmintologii, Kazanski nauchno-issledovatel'skiy veterinarnyi institut, U.S.S.R.] [Complex control measures in the prophylaxis of dictyocauliasis in the Yutazinsk area of the Tatar A.S.S.R.] **Trudi Kazanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, No. 13, pp. 414–424. [In Russian.]

Funnikova & Kuznetsov, after describing the climatic conditions of the Yutazinsk area (Tatar A.S.S.R.) and zonal peculiarities of the epizootiology of dictyocauliasis, give the results of control measures during 1954–55. These consisted principally in separate pastures and maintenance for different groups of ruminants, treatment of the animals three times a year and worming lambs 25 days after the beginning of grazing. Elimination or drastic reduction of the infection and increase in the yield of lambs and wool has resulted.
N. Jones

- 64—GAIBOV, A. D., 1957. [The treatment of fascioliasis on sheep farms.] **Trudi Azerbaidzhanskoi Nauchno-Issledovatel'skoi Veterinarnoi Obitnoi Stantsii**, 6, 48–60. [In Russian.]

Gaibov reviews the state of fascioliasis between 1947 and 1951 among sheep in the Azerbaidzhan S.S.R. where the animals remain on pasture throughout the year. He considers the distribution, age dynamics and, particularly, the control of the infection and names the months appropriate for treatment in the different districts.
G. I. Pozniak

- 65—GAIBOV, A. D. & OMAROV, I. O., 1957. [The treatment of *Echinococcus*, *Coenurus* and *Hydatigera* infections on sheep farms.] *Trudi Azerbaidzhanskoi Nauchno-Issledovatel'skoi Veterinarnoi Obitnoi Stantsii*, 6, 45-47. [In Russian.]

Two sheep farms in the Azerbaidzhan S.S.R. were adversely affected by larval cestode infections, the source of which was sheep dogs. Two courses of treatment with arecoline hydrobromide greatly reduced *Multiceps*, *Echinococcus* and *Hydatigera* infections in the dogs, and as a result infections in the sheep fell from 27% and 30.8% in 1945 to 5.2% and 4% in 1947.

G. I. Pozniak

- 66—GORDON, H. McL., 1959. [C.S.I.R.O., McMaster Animal Health Laboratory, Parramatta Road, Glebe, New South Wales, Australia.] "Control of worm parasites of sheep. Nutrition and drenching." *Wool Technology and Sheep Breeding*, 6 (1), 55-61. [Discussion pp. 61-53.]

Two chief general principles necessary for the understanding of helminth disease in grazing animals are that every animal in the flock or herd is infected and contamination of the environment is continuous. The chief controls are climate, which restricts the development of free-living stages, and immunity, which restricts the number of parasitic stages. Further principles are that the free-living stages of each species develop best under different conditions of temperature and moisture; there may be some development of almost all species all the year round in situations providing suitable though not optimum conditions; infective larvae may survive when eggs and first-stage and second-stage larvae succumb; susceptible sheep may acquire infection at almost any time but the degree of infection depends on numerous factors; lambs are highly susceptible and acquire infection as soon as they graze; there may be rhythms in periodical changes in worm burden related to general acquisition of infection, increased infection due to climatic conditions, influence of immunity and "self-cure", influence of husbandry and effects of population dynamics; the biotic potential of the parasite is considerable. Control measures are related to the stages and phases of the life-cycle (shown diagrammatically). Nutrition and resistance are closely associated but it is essential to differentiate between resistance to the establishment of infection and resistance to the effects of an infection. Details are given of two experiments in which resistance to *Trichostrongylus colubriformis* was compared in sheep on high and low planes of nutrition. A high plane of nutrition does not necessarily prevent the establishment of an infection, but may mitigate its effects. Some general principles of assessing the value of anthelmintics are given and it is concluded that there is no antagonism between nutrition and anthelmintic treatment in the control of parasitic diseases of sheep. They are complementary and supplementary, not alternatives. The discussion includes comments on differences in immunity to *T. colubriformis* and *Haemonchus contortus* and the use of irradiated larvae, the effect of grazing oats on *Oesophagostomum columbianum*, diseases associated with liver-fluke and a brief "poem" on the parasite, general application of anthelmintics, phenothiazine-resistance, oesophageal groove reflex, importance of tapeworms, rotational grazing and control of parasites.

H. McL. Gordon

- 67—LUNGU, V., STOICAN, E. & FROMUNDA, V., 1959. "Tratamentul fasciolezei ovinecuamestec ulcios de tetraclorură de carbon și hexaclorețan prin administrare parentală. Comunicarea a II-a." *Lucrarile Stiintifice ale Institutului de Patologie și Igiena Animala. Bucharest*, Year 1958, 9, 325-332. [French and Russian summaries pp. 331-332.]

Continuing their work of the preceding year, Lungu *et al.* treated 1,146 sheep against *Fasciola hepatica* infection with either Distosan *per os* or a mixture of 3 ml. carbon tetrachloride, 1.5 gm. hexachlorethane and 1 ml. vaseline oil, injected subcutaneously. They concluded that (i) as compared with Distosan treatment, parenteral administration of the mixture reduced morbidity by 50%, and that the mixture was active against immature flukes; (ii) injection of the mixture into the inner surface of the thigh resulted in a better tolerance than administration into the hairless part of the tail; (iii) modification of the mixture, e.g. by substituting cod-liver oil for vaseline oil, but leaving the basic components intact, did not increase general or local tolerance; and (iv) deterioration in the quality of meat did not follow parenteral administration of the mixture.

N. Jones

- 68—OLTEANU, G., 1959. "Profilaxia dictiocaulozei ovine din zonele de munte, deal și șes din R.P.R." **Lucrările Științifice ale Institutului de Patologie și Igienă Animală. Bucharest**, Year 1958, 9, 345–360. [French and Russian summaries pp. 358–360.]

A complex of prophylactic measures against dictyocauliasis was experimented with at three state farms in mountain, hill and plain zones respectively and involving a total of 7,476 sheep. It was concluded that: (i) prophylaxis should begin with improvement of nourishment and maintenance; (ii) prophylactic treatment should be carried out for all sheep in December and February but only during the grazing period for lambs; (iii) the use of phenothiazine, either with concentrates or with salt was therapeutically valuable and should be carried out during the spring until the end of June, and from September until the end of the grazing period in plain and hill zones, and during the whole grazing season in mountain zones and Astrakhan sheep; (iv) changing pastures for sheep with unweaned lambs once in the second half of April and once every ten days in May prevents infection of lambs; and (v) such prophylactic measures completely prevent mortality and avoid slaughtering previously made necessary by dictyocauliasis, as well as leading to greater yield of milk and wool within three months of application, as compared with the yields of control sheep.

N. Jones

- 69—ROSE, J. H., 1959. [Central Veterinary Laboratory, Ministry of Agriculture, Fisheries and Food, Weybridge, Surrey, U.K.] "Experimental infection of lambs with *Muellerius capillaris*." **Journal of Comparative Pathology and Therapeutics**, 69 (4), 414–422.

Rose infected lambs with *Muellerius capillaris*. No obvious clinical symptoms resulted but uninfected lambs made better weight gains than infected lambs. The numbers of first-stage larvae recovered on examination of faecal samples were not related to the numbers of worms observed in the lungs at autopsy. Adult worms only were present in lambs which received a single infection whereas worms in all stages of development were present in lambs which were given infective larvae at frequent intervals. Rose found in those lambs which received many doses of larvae that an appreciably smaller percentage reached the lungs than in the other lambs. He found, however, that a build-up of infection did take place.

C. Hatch

Pigs (Swine)

- 70—BABERO, B. B. & KARSTAD, L. H., 1959. [Department of Zoology, Fort Valley State College, Georgia, U.S.A.] "Studies on parasitism of feral swine in Georgia." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 44.

- 71—KELLEY, G. W. & SEN, H. G., 1959. [University of Nebraska, U.S.A.] "The incidence of swine lungworm in Nebraska." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 41.

- 72—KOVÁCS, F. & NEMESÉRI, L., 1958. [Veterinärmedizinische Hochschule, Budapest, Hungary.] "Die Behandlung der Leberegelkrankheit von Schweinen durch intramuskuläre Verabreichung von Tetrachlorkohlenstoff." **Acta Veterinaria. Budapest**, 8 (2), 165–171. [Russian summary.]

Pigs suffering from fascioliasis were cured by intramuscular injections (on the inner surface of the thigh) of a mixture of one part carbon tetrachloride to one part paraffin oil in doses of 6 ml. per 60 kg. body-weight, 8 ml. per 80 kg. and 10 ml. (split into two injections) for 100 kg. and over. The pigs received calcium carbonate and a carbohydrate-rich diet for ten days before treatment. No toxic effects could be observed; absence of diffuse liver lesions was ascertained by the bromsulphalein test. The treatment was preferable to oral administration of sheep-distol, being well tolerated by sows before and after farrowing, cheap and easy to use.

G. I. Pozniak

- 73—NICKEL, E. A., 1960. [Ver.-Parasitologisches Institut, Karl-Marx-Universität, Leipzig, East Germany.] "Untersuchungen über Verlauf und Auswirkungen experimenteller Spulwurminfektionen bei Läufer- und Mastschweinen." **Berliner und Münchener Tierärztliche Wochenschrift**, 73 (14), 265–270. [English summary p. 270.]

The experiments have shown that with *Ascaris* infections, only the migratory larval stage but not the presence of mature worms causes losses in daily weight increases of fattening pigs. In porkers given high infective doses, a decrease in daily weight gains was seen as a result of

anorexia associated with the migration of the larvae, but few or none of the worms matured. Lesser infections allowed more worms to mature. In porkers harbouring 49 and 65 mature ascarids the average daily weight gains were respectively greater than, and only 16 gm. less than, in the uninfected controls. G. I. Pozniak

- 74—OSHIO, Y. & TAKAHASHI, A., 1958. [Department of Livestock, National Institute of Agricultural Science, Chiba, Japan.] [On the treatment and prevention of *Strongyloides ransomi* in swine.] **Bulletin of the National Institute of Agricultural Sciences, Chiba. Series G. Animal Husbandry**, No. 14, pp. 137–144. [In Japanese: English summary p. 144.]

Anthelmintics were tested against *Strongyloides ransomi* of swine. 0.011 gm. to 0.020 gm. per kg. body-weight of gentian violet, given once in two weeks for six or eight weeks was found to be the most effective, without any side effects. As a preventive measure, 100 gm. of benzene hexachloride (containing 3% BHC) sprayed over the floor of 3.4 sq.m. successfully reduced the infection. Y. Yamao

- 75—POWERS, K. G., TODD, A. C. & McNUTT, S. H., 1960. [Department of Veterinary Science, University of Wisconsin, Madison, Wisconsin, U.S.A.] “Experimental infections of swine with *Trichuris suis*.” **American Journal of Veterinary Research**, 21 (81), 262–268.

Experimental infections with *Trichuris suis* were studied in four pigs at 78 days of age and two pigs at 160 days. Infective ova, which were fed in repeated doses over a three-week period, totalled 34,200 to 50,000 per pig. The infection did not establish in two pigs, one of each age group. The numbers of worms recovered at autopsy from the other four ranged from 3,600 to 13,000 or up to 38% of the ova fed. All four pigs died or were killed *in extremis* between the 43rd and the 77th day after the first infection. The prepatent period was 41 to 45 days. Egg production showed a rapid rise which was followed by a rapid fall. Symptoms of anorexia, anaemia, loss of weight and dysentery were recorded. In the older pig two types of nodules were produced in the wall of the colon, one type was soft and pus-filled and the other was granulomatous and encapsulated. L. K. Whitten

- 76—SPINDLER, L. A., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] “Massive infestation of gastrointestinal worm parasites in a farm-raised pig.” [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 46.

- 77—TODD, A. C., 1960. [Department of Veterinary Science, University of Wisconsin, Madison, Wisconsin, U.S.A.] “Control of internal parasites in swine.” **Veterinary Medicine**, 55 (1), 67–71. Todd reviews the literature on the control of internal parasites of swine. Particular reference is made to the incidence of helminths in swine in some regions of the U.S.A., control methods and anthelmintics in use, and the importance of helminths in the transmission of virus infections. It is concluded that concentration of animals may result in increasing the problem presented by helminthiasis. N. Jones

- 78—TROMBA, F. G., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, Beltsville, Maryland, U.S.A.] “Swine as potential reservoir hosts of *Hepaticola hepatica*.” **Journal of Parasitology**, 45 (2), 134.

Tromba has demonstrated experimentally that *Hepaticola hepatica* can develop to maturity and produce infective ova in domestic pigs. The lesions closely resemble the “milk-spot” lesions caused by *Ascaris*. The author considers that some lesions previously attributed to *Ascaris* in pigs may be due to *H. hepatica* and that the pig may be involved in the cycle which results in occasional infections in man. S. Willmott

Elephants

- 79—CHANDRAHASAN, M., 1959.—“The elephant.” **Madras Veterinary College Annual**, 17, 49–51.

In this article on the elephant mention is made of trematode infections, which should be treated with hexachlorethane, and a number of nematodes, which should be treated with phenothiazine. S. Willmott

Camels and Llamas

No relevant abstracts in this issue

Rabbits and Hares

- 80—LIEBMANN, H. & BOCH, J., 1960. [Zoologisch-Parasitologisches Institut der Tierärztlichen Fakultät der Universität München, München 22, Veterinärstr. 13, West Germany.] "Untersuchungen an *Cysticercus pisiformis*-befallenen Kaninchen." **Berliner und Münchener Tierärztliche Wochenschrift**, **73** (7), 123–125. [English summary p. 125.]

Liebmann & Boch, experimenting with rabbits, found that although reinfection and superinfection as well as passive immunization had some effect on numbers of *Cysticercus pisiformis* they did not produce complete destruction or inhibition of development. Two to three weeks after infection the only change in the blood picture was mild eosinophilia, but albumin level was lowered and γ -globulins increased.

J. M. Watson

Cats and Dogs

- 81—CHUN-SYUN, F., 1959. [Parazitologicheskii otdel, Kzyl-Ordinskaya oblastnaya sanitarno-epidemiologicheskaya stantsiya, U.S.S.R.] [Distribution of *Dirofilaria repens* in Kazakhstan.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, **28** (4), 483. [In Russian.]

In Kazakhstan, during the years 1953–56, infection with *Dirofilaria repens* was found in 42.6% of 970 dogs from the town Kzyl-Orda and in 4.17% of 30,700 *Aedes maculipennis sacharovi* (females).

G. I. Pozniak

- 82—IJIMA, T., HOSAKA, Y., SASAKI, T. & AKIYAMA, S., 1958. [Yamanashi Prefectural Medical Research Institute, Kofu, Japan.] [A survey of schistosome infection in dogs in endemic area of Yamanashi Prefecture.] **Japanese Journal of Parasitology**, **7** (1), 74–77. [In Japanese: English summary p. 77.]

Out of 462 dogs from the endemic schistosomiasis area in Yamanashi Prefecture, 118 (25.5%) were proved positive for eggs of *Schistosoma japonicum* by faecal examination. No significant difference was found between the sexes. The incidence of the infection gradually increased with age. The infection rate in the northern hilly district was 32.6% and in the southern plain district 20.6%.

Y. Yamao

- 83—ITO, J. ET AL., 1959. [Hygiene Laboratory, Faculty of Education, Shizuoka University, Shizuoka, Japan.] [An investigation of the helminth parasites of dogs in Shizuoka Prefecture. Cestodes.] **Japanese Journal of Parasitology**, **8** (5), 649–654. [In Japanese: English summary p. 654.]

Five species of cestodes were recovered from 192 dogs in Shizuoka Prefecture in the period 1956–57. The species and their infection rates were as follows: *Dipylidium caninum* 45.7%, *Taenia taeniaeformis* 6.8%, *Diphyllbothrium mansonii* 3.6%, *T. pisiformis* 0.5% and *Mesosestoides litteratus* 0.5%.

Y. Yamao

- 84—NAKAMURA, H., 1958. [Suita City, Osaka, Japan.] [Treatment of canine filariasis by introduction of Fuadin, Bayer, into the right ventricle.] **Journal of the Japan Veterinary Medical Association**, **11** (11), 564–566. [In Japanese.]

Five dogs with proved filariasis were treated with foudadin by injecting it directly into the right ventricle. 1/1 gauge and 7.5 cm. length needles were used. The first injection was 2 c.c., the second 3 c.c., the third 3 c.c. to 5 c.c. with an interval of three to seven days between each injection. No serious side effect was observed. Symptoms due to filariasis subsided relatively rapidly and the general condition improved.

Y. Yamao

- 85—VERGANI S., F., 1959. "Presencia en caninos de Venezuela del *Ancylostoma braziliense* de Faria, 1910." **Boletín del Instituto de Investigaciones Veterinarias. Caracas**, Year 1958–59, **10/11** (26), 45–46.

Vergani reports on the finding of *Ancylostoma braziliense* in the intestine of a dog in Caracas. The author gives briefly the mean measurements of the worms and the paper contains a photomicrograph.

N. Jones

- 86—VUKOVIĆ, V., 1959. [Interna i Hirurška klinika, Veterinarski fakultet, Univerzitet, Sarajevo, Yugoslavia.] "Prilog poznavanju parazitaranih oboljenja mesojeda." **Veterinaria. Sarajevo**, 8 (3/4), 605–610. [English summary p. 605.]
1,683 dogs and cats were examined at the University of Sarajevo during 1952–58. 15.2% of the animals had parasitic infections which were the direct causes of primary diseases in 6.29%. It is shown in the tables that the incidence of helminthiasis was: *Taenia hydatigena* and *T. taeniaeformis* (joint incidence) 3.03%, *Dipylidium caninum* 1.3%, *Echinococcus granulosus* 0.5%, *Mesocostoides* 0.05%, *Toxocara canis* and *T. mystax* (joint incidence) 7.4%, *Ancylostoma* and *Uncinaria* (joint incidence) 0.47%, *Trichuris vulpis* 0.29%, *Tetrathyridium bailleti* 0.05% and ascarid infection 2.6%. The author recommends: (i) a dose of 2 gm. to 10 gm. kamala against taeniasis in dogs under the age of three months, and (ii) 1% arecoline hydrobromide (0.2 c.c. per kg. body-weight) in older dogs. In both cases the drug is intubated into the stomach with 15 gm. to 20 gm. Carlsbad salt and 50 c.c. to 100 c.c. of water. Against ascarids, Thelmin (piperazine hexahydrate) is recommended *per os* at the following doses per kg. body-weight: 3 c.c. to 5 c.c. to dogs, and 5 c.c. to 8 c.c. to cats. N. Jones

Fur-Bearing Animals

- 87—ZIMMERMANN, H., 1959. [Veterinäruntersuchungsamt, Greifswald, Str. d. Nat. Einheit 1, Deutsche Demokratische Republik.] "Invasionskrankheiten bei Farmnerzen." **Acta Parasitologica Polonica**, 7 (23/35), 539–548. [Polish summary p. 548.]
The parasites found on examination of 208 *Lutreola vison* (for the cause of death) and 1,680 faecal samples, sent in from breeding farms in eastern Germany, included the helminths *Apophallus muehlingi*, *Tocotrema lingua*, *Nanophyetus salminalcola* and *Strongyloides papillosus*. Only 1.9% of the deaths were due to parasites and the species responsible were *T. lingua*, *A. muehlingi* and the coccidian *Eimeria* sp. G. I. Pozniak

Laboratory Animals

- 88—BEZUBIK, B. & FURMAGA, S., 1959. [Katedra Parazytologii, Wyższa Szkoła Rolnicza, Lublin, Akademicka II, Poland.] "The helminth parasites in *Macacus rhesus* Audeb., from China." **Acta Parasitologica Polonica**, 7 (23/35), 591–598. [Polish summary p. 598.]
An examination in Lublin of 100 *Macacus rhesus*, recently bought from China for use in vaccine production, showed 71% to be infected with nematodes (six species), 7% with trematodes (two species) and 4% with cestodes (two species). *Ogmocotyle indica*, *Ternidens deminutus*, *Trypanoxyuris bipapillata* and *Streptopharagus pigmentatus* are new parasites for *M. rhesus*. Pathological changes were only observed in the intestine with heavy *S. pigmentatus* infections and in the liver in the presence of *Fasciola hepatica*. G. I. Pozniak
- 89—GRAHAM, G. L., 1960. [Laboratory of Parasitology, University of Pennsylvania, School of Veterinary Medicine, Philadelphia, Pa., U.S.A.] "Parasitism in monkeys." **Annals of the New York Academy of Sciences**, 85 (3), 842–860.
Graham discusses briefly some parasites found in captive monkeys. He suggests that the effects of helminthic infections, which are of minor importance under natural environmental conditions, may be increased by unsuitable conditions in captivity. The two outstanding nematode genera in terms of frequency of infection and parasitic importance are *Oesophagostomum* and *Strongyloides*. Some information about the life-cycles of these genera is given. A range of spirurid, trichostrongylid, trichurid, metastrongylid and oxyurid nematodes is listed. In addition several pseudo-parasitic species and species of uncertain importance receive a brief comment. The reader is referred to Webber (1955) [for abstract see Helm. Abs., 24, No. 67b] for a review of filarial parasites in monkeys. The pathological response induced by the trichostrongyle *Noctia nocti* in the stomach of the *Cynomolgus* monkey is compared with a similar reaction induced by the strigeid trematode *Braunina cordiformis* in the stomach of the porpoise. The monkey acts as intermediate or definitive host for a wide range of cestodes although the author has seen adults of the genus *Bertiella*

only. Trematode infections recorded include *Schistosoma japonicum*, *S. mansoni*, *Fasciola hepatica*, *Ogmocotyle indica*, *Watsonius watsoni* and *Gastrodiscoides hominis*. This is apparently the first report of *G. hominis* as a parasite of monkeys. Under certain conditions infection with the acanthocephalan *Prosthenorchis elegans* can prove lethal to monkeys. J. E. D. Keeling

- 90—HAYASHI, S., SATO, KOJI, SATO, KINSAKU & TAKADA, A., 1959. [Department of Parasitology, Institute for Infectious Diseases, University of Tokyo, Tokyo, Japan.] [Experimental epidemiology of helminthic infections. Observations on the infestation of albino mouse colonies with *Syphacia obvelata* (nematode: Oxyuridae).] **Japanese Journal of Parasitology**, 8 (5), 714–720. [In Japanese: English summary pp. 719–720.]

Hayashi *et al.* observed the incidence curves of infection among mice which were kept parasite-free in a large cage and then brought into contact with a number of mice infected with *Syphacia obvelata*. There was no difference in susceptibility of the mice. Mice which had been previously infected with *S. obvelata* were all susceptible to a second infection but showed a variable prolongation in the incubation period, indicating that there was a slight acquired immunity. The incidence curves in all experiments were well fitted to the logarithmic normal distribution as suggested by Startwell (1950) in various infectious diseases. However, the estimation of an average incubation period and the day of exposure on the basis of the method of finite differences introduced by T. Hirayama (1949) and by K. Horiuchi & H. Sugiyama (1956) did not give satisfactory results. Y. Yamao

- 91—IWAŃCZUK, I. & ŁUKASIAK, J., 1959. [Zakład Parazytologii Lekarskiej P.Z.H., Warszawa, Chocimska 24, Poland.] “Szczególny przypadek cysticerkozy u białej myszy.” **Acta Parasitologica Polonica**, 7 (23/35), 533–538. [English summary pp. 536–537.]

A mass infection with 173 *Cysticercus fasciolaris* cysts is reported in a white mouse. It is stated that this animal was reared under the required conditions of hygiene and, as far as could be ascertained, had not had any direct contact with a cat. G. I. Pozniak

- 92—MILADINOVIĆ, Ž. & SEMZE-RAFAELI, A., 1960. [Medicinski fakultet, Univerzitet u Sarajevu, Yugoslavia.] “*Cysticercus fasciolaris* (Rudolphi 1808) kod belih miševa.” **Veterinaria. Sarajevo**, 9 (2), 363–364. [English summary p. 363.]

Cysticercus fasciolaris was found in the livers of 1.6% of 874 white laboratory mice. 13 of these infected mice had also been infected with *Toxoplasma gondii* but the cysticerciasis did not affect the development of the *Toxoplasma* or have any influence when peritoneal exudate was used in the Sabin-Feldman's test (Dye-test). N. Jones

- 93—NEWTON, W. L., WEINSTEIN, P. P. & JONES, M. F., 1959. [Laboratory of Tropical Diseases, National Institute of Allergy and Infectious Diseases, Public Health Service, Bethesda, Maryland, U.S.A.] “A comparison of the development of some rat and mouse helminths in germfree and conventional guinea pigs.” **Annals of the New York Academy of Sciences**, 78 (1), 290–306. [Discussion p. 307.]

Guinea-pigs which had been delivered and maintained germ-free were compared with conventional guinea-pigs as hosts for a number of helminths normally parasitic in rats and mice. In conventional animals *Nippostrongylus muris* failed to develop but fourth-stage larvae and adults were recovered from two of six germ-free guinea-pigs which received similar infections. Germ-free animals proved more satisfactory hosts for *Nematospiroides dubius* than did conventional animals. It was demonstrated that the method of delivery and type of diet were not the underlying reason for this difference. Both species produced fertile eggs in germ-free animals. *Hymenolepis nana* developed successfully in both types of host. J. E. D. Keeling

Poultry

- 94—ABMAYR, J., 1959. “Die Endoparasiten von Huhn, Gans und Ente im Gebiet von Günzburg/Do. unter besonderer Berücksichtigung von Alter, Fütterung und Umweltbedingungen.” **Dissertation, Munich**, 67 pp.

- 95—LUND, E. E., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Factors influencing the distribution of *Heterakis* in the ceca of chickens and turkeys." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 43.
- 96—McCLEAN, E. E., 1958. "Worm infestations in poultry." **Monthly Agricultural Report. Ministry of Agriculture, Northern Ireland**, 32 (10), 306–307.
McCLean in her article advises poultry keepers on the prevention and treatment of round-worms in poultry. C. Hatch

Other Mammals

- 97—CLARK, G. M. & HERMAN, C. M., 1959. [Patuxent Research Refuge, Laurel, Maryland, U.S.A.] "Parasites of the raccoon, *Procyon lotor*." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 58.
- 98—GRUNDMANN, A. W. & FRANDSEN, J. C., 1959. [Department of Zoology, University of Utah, U.S.A.] "A study of the parasitism of the deer mouse, *Peromyscus maniculatus*, in the Bonneville Basin of Utah and its role in parasite distribution." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 34–35.
- 99—JORDAN, H. E. & HAYES, F. A., 1959. [Department of Pathology and Parasitology, School of Veterinary Medicine, University of Georgia, Athens, Georgia, U.S.A.] "Gastrointestinal helminths of raccoons (*Procyon lotor*) from Ossabaw Island, Georgia." **Journal of Parasitology**, 45 (3), 249–252.

The helminths found in *Procyon lotor* from Ossabaw Island (Georgia) were *Carneophallus turgidus*, *Atriotaenia procyonis*, *Macracanthorhynchus ingens*, *Arthrocephalus lotoris*, *Molineus barbatus*, *Physaloptera maxillaris* and *Gnathostoma procyonis*. With the exception of *C. turgidus*, this extends the range of these helminths in the U.S.A. to the extreme south-eastern region. All but *C. turgidus* and *P. maxillaris* have been described from East Texas. Pathological lesions were only observed in the four raccoons infected with *G. procyonis*; in these tumour-like growths, 1 cm. to 2 cm. in diameter, were found associated with the parasites. S. Willmott

- 100—LAING, A. B. G., EDESON, J. F. B. & WHARTON, R. H., 1960. [Institute of Medical Research, Kuala Lumpur, Federation of Malaya.] "Studies on filariasis in Malaya: the vertebrate hosts of *Brugia malayi* and *B. pahangi*." **Annals of Tropical Medicine and Parasitology**, 54 (1), 92–99.
From blood surveys of wild and domestic animals in East Pahang, Malaya, Laing *et al.* show that *Brugia malayi* and *B. pahangi* can live in a wide range of vertebrate hosts. Single infections of the semi-periodic form of *B. malayi* were found in five species of mammals: *Macaca irus* (four infected, 116 examined), *Presbytis obscurus* (19 infected, 25 examined), domestic cats (five infected, 88 examined), *Paradoxurus hermaphroditus* (one infected, 44 examined), and *Manis javanica* (one infected, 11 examined). Single infections of *B. pahangi* were discovered in ten species of mammals: *Nycticebus coucang* (eight infected, 25 examined), domestic cats (14 infected, 88 examined), domestic dogs (five infected, 25 examined), *Panthera tigris* (one infected, one examined), *Felis planiceps* (one infected, one examined), *Paradoxurus hermaphroditus* (12 infected, 44 examined), *Arctogalidia trivirgata* (one infected, three examined), *Viverra zibetha* (one infected, one examined), *Echinorex gymmurus* (two infected, four examined), and *Ratufa* spp. (one infected, 11 examined). Both *Brugia* species were found in domestic cats (four cases), *Felis bengalensis* (one double infection, seven examined) and *Manis javanica* (two cases). Infections with *Brugia* species were not detected in a further 23 species of mammals and six species of birds. P. Williams

- 101—MILLER, J. H., 1959. [Louisiana State University School of Medicine, U.S.A.] "The dog face baboon, *Papio doguera*, a primate reservoir host of *Schistosoma mansoni* in East Africa." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 22.

- 102—NISHIDA, H., 1957. [Department of Public Health, Faculty of Medicine, Tottori University, Yonago, Japan.] [On *Gnathostoma doloressi* Tubangui, 1926 in Chûgoku region.] **Journal of the Yonago Medical Association**, 8 (3), 465–467. [In Japanese.]

The stomachs of 48 wild boars were examined for *Gnathostoma doloressi* from February 1955 to January 1957, in the Chûgoku region, including Hyogo Prefecture. The adult worms of *G. doloressi* were found in 11 of them.

Y. Yamao

- 103—NISHIDA, H., 1957. [Department of Public Health, Faculty of Medicine, Tottori University, Yonago, Japan.] [On *Gnathostoma nipponicum* Yamaguti, 1941 in San-in District.] **Journal of the Yonago Medical Association**, 8 (3), 468–470. [In Japanese.]

335 weasels, *Mustela itatsi*, and three martens, *Martes melampus*, were examined for *Gnathostoma nipponicum* from November 1954 to January 1956 in San-in District. The adult worms were found in four weasels, two of which were caught in Tottori Prefecture and the other two in Shimane Prefecture.

Y. Yamao

- 104—PRICE, D. L., 1960. [University of Maryland, U.S.A.] “Epizootiological studies on some filarioid parasites of the family Dipetalonematidae (Nematoda: Filarioidea) found in certain small mammals.” **Dissertation Abstracts**, 20 (10), 4222–4223.

- 105—SOLTYS, A., 1959. [Katedra Parazytologii, Wyższa Szkoła Rolnicza, Lublin, Akademicka II, Poland.] “The helminth fauna of bats (Chiroptera) of Lublin Palatinate.” **Acta Parasitologica Polonica**, 7 (23/35), 599–613. [Polish summary p. 613.]

Of 161 bats examined belonging to 11 species (chiefly *Nyctalus noctula*, *Eptesicus serotinus* and *Myotis daubentoni*), 79% were infected with helminths. The species listed, with their earlier and newly reported hosts and data on their distribution and morphology, are: *Capillaria neopulchra*, *Molinosstrongylus tipula*, *Physaloptera myotis*, *Hymenolepis* sp., *H. christensoni*, *Parabascus semisquamatus*, *Plagiorchis vespertilionis*, *Lecithodendrium linstowi*, *L. granulosum*, *Travassodendrium chilostomum* n.comb., *T. magnum* n.comb. and *T. raabei* n.sp. Both new combinations are transferred from *Prosthodendrium* on the basis that all *Lecithodendriidae* with the vitellaria and ovary anterior to the ventral sucker belong in *Travassodendrium*. The new species *T. raabei* is parasitic in the intestine of *N. noctula* and differs from other species in the genus by the characteristically pear-shaped body, the longer oesophagus and the size of the suckers, testes and ovary. All the species except *P. vespertilionis* and *L. linstowi* are new for Poland.

G. I. Pozniak

- 106—WATANABE, A., 1959. [Hiroshima Prefectural Kan-nabe Upper Secondary School, Hiroshima, Japan.] [Studies on trematode parasites of bats in Hiroshima Prefecture, with some reference to the function of Laurer's canal. I.] **Japanese Journal of Parasitology**, 8 (6), 849–857. [In Japanese: English summary pp. 854–857.]

Watanabe studied six species of trematodes from bats in Hiroshima Prefecture. They were found in the upper part of the small intestine of three species, namely, *Rhinolophus ferrum-equinum*, *R. cornutus* and *Nyctalus maximus*. He concluded that: species A from *R. ferrum-equinum* was very similar to *Plagiorchis fuji* (Ogata, 1941); species B from *R. cornutus* belonged to the genus *Lecithodendrium* (*Prosthodendrium*); species C from *N. maximus* was similar in its general organization to *Plagiorchis muris* (Tanabe, 1922) but quite different in the size of the body and eggs; species D from *N. maximus* belonged to the *Plagiorchiidae*; species F from *N. maximus* belonged to *Lecithodendrium*. The life-history of the these five species is still unknown. Species E from *N. maximus* was very similar to *L. ovatum* (Yamaguti, 1939) but differed in size and in the identity of the intermediate host. From these findings he identified this as a new species and named it *Acanthatrium rotundum* Asada & Watanabe. He states also that the function of Laurer's canal seemed to be connected with the elimination of extra yolk cells.

Y. Yamao

- 107—WERTHEIM, G., 1959. [Hebrew University-Hadassah Medical School, Jerusalem, Israel.] “The infectivity of *Strongyloides ratti* for various rodent hosts.” [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 37.

Other Birds

108—BENNETT, G. F. & FALLIS, A. M., 1959. [Ontario Research Foundation, Toronto 5, Canada.] "Blood parasites of birds in Algonquin Park, Canada, and a discussion of their transmission." [Abstract.] *Journal of Parasitology*, **45** (4, Sect. 2), 33.

109—BEVERLEY-BURTON, M., 1958. [Zoology Department, University College of Rhodesia and Nyasaland, Private Bag 167H, Salisbury, Southern Rhodesia.] "Some helminths from fresh water birds in Suffolk." *Transactions of the Suffolk Naturalists' Society*, **11** (1), 29-43.

A list of the helminths recovered from wild duck and moorhens in Suffolk is given. Mallard, pintail and shoveler ducks carried a wider variety of helminth species than did widgeon or teal, which may be correlated with the idea that the two last-mentioned are vegetable feeders. *Notocotylus gibbus* and *Hymenolepis abortiva* are redescribed. The distribution of the various forms in the body of the host is given. M. Beverley-Burton

110—BEZUBIK, B., 1960. [Katedra Parazytologii, Wyższa Szkoła Rolnicza, Lublin, Akademicka II, Poland.] "Helminth parasites of black-grouse (*Lyrurus tetrix* L.) and capercaillie (*Tetrao urogallus* L.)." *Acta Parasitologica Polonica*, **8** (1/7), 37-46. [Polish summary p. 46.]

87 *Lyrurus tetrix* and 18 *Tetrao urogallus* were shot during April and May over a period of four years, chiefly in the Lublin area of Poland. The following helminths were found in the two species: *Raillietina urogalli* (infecting 34% and 2% respectively), *R. cesticillus* (17% and none), *Ascaridia compar* (77% and 12%), *Heterakis gallinae* (5% and 1%) and *Capillaria caudinflata* (3% and none). *R. urogalli* is reported for the first time for Poland. Original morphological data are given for the five helminths. G. I. Pozniak

111—HWANG, J. C. & WEHR, E. E., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Occurrence of *Capillaria obsignata* Madsen, 1945, in the peafowl and its transmission to chickens." [Abstract.] *Journal of Parasitology*, **45** (4, Sect. 2), 47.

112—JUDD, W. W., 1959. [Department of Zoology, University of Western Ontario, London, Ontario, Canada.] "Nematode worms, *Diplotrriaena tricusps* (Fedt.), from the body cavity of a Nashville warbler at London, Ontario." *Canadian Field-Naturalist*, **73** (2), 130.

Judd reports *Diplotrriaena tricusps* from the body-cavity of *Vermivora ruficapilla* at London, Ontario. W. G. Inglis

113—MERKUSHEV, A. V., 1960. [Voronezhski veterinarno-zootekhicheski institut, U.S.S.R.] [The role of birds in the spread of *Trichinella spiralis* in nature.] *Zoologicheskii Zhurnal*, **39** (2), 161-164. [In Russian: English summary p. 164.]

Jackdaws, crows, tomtits and chickens were experimentally infected with trichinous meat. Birds with a carnivorous habit (i.e. *Corvus corone*) passed excysted, spirally coiled larvae which had not yet moulted, and such larvae remained infective to new hosts (mice) for over 15 days within moist faeces. In birds in which carnivorous habits were less pronounced (*Parus major*, *Coloeus monedula*) the larvae moulted and developed sexually within the intestine; the faeces of such birds, therefore, play only a very restricted role in spreading the infection. G. I. Pozniak

114—SPASSKAYA, L. P., 1958. [Gelmintologicheskaya laboratoriya A.N. S.S.S.R. i Kafedra obshchei biologii 1-go Moskovskogo Ordena Lenina Meditsinskogo instituta.] [Cestodes in birds in the Komi A.S.S.R.] *Acta Veterinaria. Budapest*, **8** (2), 173-185. [In Russian: German summary p. 185.]

Examination of 961 birds from the middle reaches of the Pechora river in the Komi A.S.S.R. revealed the presence of helminths in 547 specimens. The incidence of cestodes was 36%. The birds belonged to 81 species and to the following orders: Galliformes, Charadriiformes, Anseriformes, Falconiformes, Cuculiformes and Passeriformes. Only two and four specimens of Lariformes and Colymbiformes respectively were examined; the incidence of cestode infection in these is not given. Incidence ranged from 5.5% to 78% among the other host orders.

It was highest among Charadriiformes (78%) and slightly lower among Galliformes and Anseriformes (75% and 72% respectively). Altogether 47 cestode species were recorded, representing the following families: Tetrabothriidae, Davaineidae, Idiogenidae, Hymenolepididae, Dilepididae, Paruterinidae and Acoelidae. The cestode fauna of birds in this region is discussed with reference to its dependence on the composition of the host's food, and the change in the cestode fauna of birds of the Komi A.S.S.R. related to their migration. Cestodes recorded are classified according to geographical distribution and zones of infection.

N. Jones

- 115—SULGOSTOWSKA, T., 1960. [Zakład Zoologii, S.G.G.W., Warszawa, Rakowiecka 8, Poland.] "Intestinal trematodes of birds of mesotrophic lakes: Goldapiwo and Mamry Północne." **Acta Parasitologica Polonica**, 8 (1/7), 85–114. [Polish summary p. 114.]

652 birds (47 species) collected on the two mesotrophic lakes Goldapiwo and Mamry Północne were examined and 72.7% were found infected with 36 species of trematodes (Strigeidae are being studied by Niewiadomska and are excluded here). Tabulated data give the number of birds examined, the percentage infected, the frequency of parasites on the two lakes and the trematode families occurring in each bird species. New host records are made for *Echinoparyphium recurvatum*, *Mesorchis pseudoechinatus*, *Moliniella anceps*, *Plagiorchis nanus*, *Prosthogonimus cuneatus*, *Schistogonimus rarus* and *Leucochloridium cyanocittae*, and the following are reported as new for Poland: *E. clercki*, *Echinochasmus amphibolus*, *Echinostoma grandis*, *Episthmium mathevossianae*, *M. anceps*, *Petasiger exaeretis*, *P. neocomense*, *S. rarus*, *Apopharynx bolodes*, *Psilotrema simillimum*, *Psilostomum spiculigerum*, *Neoleucochloridium holostomum*, *Laterotrema arenula* and *Hypoderaeum skrjabini*. The material of *Hypoderaeum* from *Aythya ferina* from Lake Družno also belongs in *H. skrjabini* and was mistakenly identified by Sulgostowska as *H. conoideum* [for abstract see Helm. Abs., 27, No. 180c]. On the basis of a comparison of the measurements and drawings given by Shakhtakhtinskaya and by Shigin and on the present material, Sulgostowska makes *Episthmium colymbi* a synonym of *E. mathevossianae*. The trematode fauna is briefly considered in relation to the availability of final and intermediate hosts, host diet and to seasons, and is divided into three groups according to the host specificity shown.

G. I. Pozniak

- 116—ULMER, M. J., 1959. [Iowa State College, U.S.A.] "Avian schistosomes of the genus *Ornithobilharzia* at Lake Okoboji, Iowa." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 19.

Reptiles and Amphibia

- 117—MAZURMOVICH, B. N., 1957. [Kafedra zoologii bezpozvonochnikh, Kievski universitet, Kiev, U.S.S.R.] [The interrelationships of parasitic worms in amphibians.] **Trudi Leningradskogo Obshchestva Estestvoispytatelei. Otdelenie Zoologii**, 73 (4), 204–207. [In Russian: German summary p. 207.]

An analysis of the parasite fauna of several species of amphibians near Kiev revealed the existence of antagonism between the trematode *Haematoleechus* and the nematode *Rhabdias bufonis*. *R. bufonis* was present in the lungs of *Bufo viridis* and *Rana temporaria*, and *Haematoleechus* in the lungs of *R. ridibunda*, *R. esculenta* and *Bombina bombina*. A similarly antagonistic relationship was seen between intestinal nematodes and trematodes in *R. ridibunda*. A representative set of results shows that of 136 frogs, 41.2% had pure *Opisthioglyphe ranae* infections, 13.2% pure *Aplectana acuminata* infections and only 7.4% had mixed infections. The relationship of intestinal acanthocephalans (predominating species *Acanthorhynchus ranae*) to trematodes and nematodes was of a synergic character.

G. I. Pozniak

- 118—SCHROEDER, P. J. & ULMER, M. J., 1959. [Iowa State College, U.S.A.] "Host-parasite relationships of *Spirorchis elegans* Stunkard (Trematoda: Spirorchidae)." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 19.

Miscellaneous

- 119—BORCHERT, A., 1959. [Institut für Veterinärmedizinische Parasitologie, Humboldt-Universität, Berlin.] "Die Grundlagen einer Bekämpfung der Parasitosen unserer Haus- und Nutztiere." **Monatshefte für Veterinärmedizin**, 14 (12), 361-363.

The general principles to be followed in the prophylaxis and treatment of farm animals against internal and external parasites are described. G. I. Pozniak

- 120—ČEBOTAREV, R. S. & POLIŠČUK, V. P., 1959. [Department of Parasitology, Zoological Institute, Kiev, Kreščatik 15, U.S.S.R.] "Gongylonematosis of domestic animals under conditions of Ukrainian Polesie and forest-steppe areas." **Acta Parasitologica Polonica**, 7 (23/35), 549-558. [Polish summary p. 557.]

In the Ukraine, *Gongylonema pulchrum* infects from 32% to 94% of adult cattle, from 39% to 95% of sheep and none to 37% of pigs. The intensity varies from one to several hundred worms. Larvae were identified in 28 species of beetles belonging to the families Scarabaeidae and Tenebrionidae. About 15 of the species were new hosts for *G. pulchrum*. The larval stages are described and compared with these of *Physocephalus sexalatus* and *Spirocerca lupi*. On allergic diagnosis with antigen prepared from adult worms, all uninfected young cattle gave negative reactions, while older infected cattle and cattle which had previously been infected reacted positively. G. I. Pozniak

- 121—EISENRIEDER, H., 1959. "Endoparasiten der Haustiere im Landkreis Mainburg." **Dissertation, Munich**, 62 pp.

- 122—FUNNIKOVA, S. V., 1959. [Otdel gelmintologii, Kazanski nauchno-issledovatel'ski veterinarni institut, U.S.S.R.] [Control of dictyocauliasis by periodic anthelmintic treatment.] **Trudi Kazanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, No. 13, pp. 398-402. [In Russian.]

Funnikova reports on the results of treatment of dictyocauliasis on two collective farms with a total of 1,680 sheep, of which 58% were infected, and 356 calves of which 25.4% were infected. The treatment was carried out in the Tatar Republic during 1952-54 and consisted of (i) separation of the preceding year's and the current year's calves and adults on the pastures; (ii) treatment of calves and sheep in the spring, summer and autumn. At the end of the treatment the incidence of dictyocauliasis was reduced to 4% in sheep and to zero in calves. N. Jones

- 123—GEMMELL, M. A., 1958. [Hydatid Research Unit, University of Otago Medical School, Dunedin C.1, New Zealand.] "Cestode problems of domestic animals and man in the South Island of New Zealand." **New Zealand Medical Journal**, 57 (321), 442-458.

The history of educational and control measures adopted against hydatid in New Zealand and reasons for past failures and present dominion-wide interest are outlined. Progress in control in the last few years is correlated with survey results. From these, Gemmell recommends that arecoline should be taken out of the hands of dog owners and should now be used as a diagnostic agent by trained control officers throughout New Zealand. He considers that failure to take advantage of the present enthusiasm resulting from the very high standard of health education will result in a return to previous apathy. The incidence of *Echinococcus granulosus* recorded in sheep varied from 3.3% in lambs to 42.4% in old sheep. The incidence in dogs varied from 5.6% in farm dogs where some precautions were being taken to 37.3% in dogs where no control measures had been adopted. At abattoirs the incidence was 11.2% but only 2.3% in urban dogs. Incidences of other tapeworms (*Taenia hydatigena*, *T. ovis* and *Multiceps multiceps*) are also recorded. M. A. Gemmell

- 124—JASKOSKI, B. J., 1959. [Loyola University, Chicago, U.S.A.] "Nematodes from some captive animals." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 58-59.

- 125**—JOVOV, K., 1959. [Epizootiološko-dijagnostička stanica, Tuzla, Yugoslavia.] "Prilog poznavanju dinamike pojedinih vrsta trihostrongilida kod ovaca i goveda tuzlanske okoline." **Veterinaria, Sarajevo**, 8 (3/4), 539–546. [English summary p. 539.]
 Jovov studied the degree of infection with individual trichostrongylid species in 130 sheep and 80 cattle in the Tuzla district from mid-March, 1958 until mid-March, 1959. The material was recovered from the small intestine and periodically from the abomasum (at least once a week). In this way the population dynamics and seasonal occurrence of 21 species belonging to eight genera were studied, which showed that they could be divided into four groups in sheep, and into three groups in cattle. The population dynamics of two of the groups were identical in both hosts. This is said to be the first record of *Cooperia oncophora* and *C. punctata* in sheep and *C. curticei* in cattle in Yugoslavia, while *C. zurnabada* and *Ostertagia lasensis* in sheep and *Trichostrongylus vitrinus* in cattle are said to be the first host records. As *Ostertagia* sp. and *Spiculopteria* sp. could not be identified with any of the species in the literature consulted, the author gives an illustrated description of them. N. Jones
- 126**—NISHIDA, H., 1957. [Department of Public Health, Tottori University, Yonago, Japan.] [On gnathostomiasis and *Gnathostoma spinigerum* Owen, 1836 in San-in District.] **Journal of the Yonago Medical Association**, 8 (3), 460–464. [In Japanese.]
 73 *Ophicephalus argus*, 14 birds, five weasels, 81 cats and 86 dogs were examined for *Gnathostoma spinigerum* with negative results. All of the specimens examined were collected from April 1954 to January 1957 in Shimane and Tottori Prefectures, where *O. argus* was known to be distributed. Y. Yamao
- 127**—SOBRERO, R., 1960. [Istituto Siero vaccinogeno, Merca, Somalia.] "Animali domestici ospiti naturali di *Schistosoma bovis* in Somalia." **Rivista di Parassitologia**, 21 (2), 125–130. [English summary p. 130.]
Schistosoma bovis was found in about 38% of 355 bovines, in one goat, in one donkey and in one out of 328 dromedaries. The examinations were carried out at the abattoirs of Merca and Chisimaio (Somalia) in 1957. The worms found were smaller than the type species. In all cases the parasites were recovered from the mesenteric veins, except in the case of massive infections in bovines, where they were also recovered from the liver, pancreas and spleen. This is said to be the first report of *S. bovis* from the dromedary. N. Jones
- 128**—VOGEL, H., 1960. [Bernhard-Nocht-Institut für Schiffs- und Tropenkrankheiten, Hamburg, West Germany.] "Tiere als natürliche Wirte des *Echinococcus multilocularis* in Europa." **Zeitschrift für Tropenmedizin und Parasitologie**, 11 (1), 36–42. [English summary pp. 41–42.]
 Vogel reports on the occurrence of *Echinococcus multilocularis* in wild animals in European areas where alveolar echinococcosis is endemic. Eight of 20 red foxes (*Vulpes vulpes*) harboured the tapeworm stage. Out of a total of 991 various small rodents examined, only four voles (*Microtus arvalis*) were infected with the larval stage. The role of domestic dogs and cats as definitive hosts is discussed. Experimental infections have established that the adult stage will develop in both of these hosts producing eggs which are infective to rodents. The author suggests that the cat is a major source of human infection and that a domestic cat-house-mouse-cat cycle exists, in addition to the primary sylvatic fox-vole-fox cycle. G. A. Webster
- 129**—WANDTNER, H., 1959. "Der Parasitenbefall unserer Haustiere im Landkreis Grafenau." **Dissertation, Munich**, 51 pp.
- 130**—ZIMOROI, I. Y., 1959. [Kurski pedagogičeski institut, U.S.S.R.] [Natural foci of trichinellosis in the Kursk region.] **Meditinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 28 (5), 586–589. [In Russian: English summary p. 589.]
 The existence of natural foci of trichinellosis has been established in the Kursk region, the animals infected being wolves, foxes and racoon-like dogs. From among domestic animals, three town dogs of 162 examined were infected, but not 1,124 pigs, 66 cats or 15 rats. G. I. Pozniak

FISHERIES HELMINTHOLOGY

Fresh-Water Fisheries

- 131—BAUER, O. N., 1957. [Laboratoriya boleznei rib, Vsesoyuznii nauchno-issledovatel'skiy institut ozernogo i rechnogo rybnoho khozyaistva, Leningrad, U.S.S.R.] [Parasite fauna of young *Salmo salar* during their development.] **Trudi Leningradskogo Obshchestva Estestvoispytatelei. Otdelenie Zoologii**, 73 (4), 159–163. [In Russian: English summary p. 163.]

The nine parasites found in 200 fingerlings of *Salmo salar* from hatcheries in the River Narova included the helminths *Diplostomulum spathaceum*, *Bucephalus polymorphus* and *Gyrodactylus* sp. All the parasites, with the possible exception of *Gyrodactylus*, are wide-spread among the wild fish in the river. It is possible that the *Gyrodactylus* will prove, on examination of more extensive material, to be a new species specific to salmon.

G. I. Pozniak

- 132—HOFFMANN, J., 1959. [Lab. Biologie, Lycée de Garçons, Luxembourg.] “À propos d’une ‘maladie de captivité’ des Cystobranches.” **Archives. Institut Grand-Ducal de Luxembourg. Section des Sciences Naturelles, Physiques et Mathématiques**, 26, 237–243.

Cystobranchus respirans collected from trout in April and held under aquarium conditions in May developed swellings and white pustules which are centres of infection leading to death. This does not occur on leeches remaining on fish. Isolated leeches did not develop pustules. Leeches held together mostly developed the disease. Hoffmann describes a copulation-like attack of one leech on another with attachment of the anterior sucker with signs of powerful suction, and after the attack a minute injury on the victim. The injury swells and forms a pustule often infected with *Saprolegnia*.

L. R. Richardson

- 133—IVASIK, V. M., 1960. [Lvovski zooveterinarni institut, U.S.S.R.] [The importance of other fish in the spread of parasites in carp ponds.] **Zoologicheski Zhurnal**, 39 (2), 299–301. [In Russian: English summary p. 301.]

Ivasik has examined for parasites several species of fish found in carp ponds in the Ukraine. He concludes that although *Carassius auratus gibelio*, *Tinca tinca* and *Esox lucius* may be introduced with carp, *C. carassius* should be avoided as it carries a particularly large number of parasites which also attack carp, including the helminths *Dactylogyrus vastator*, *D. anchoratus*, *Gyrodactylus elegans*, *G. medius* and the leech *Piscicola geometra*. The ponds should also be kept clear of wild fish species, several of which are a source of carp parasites.

G. I. Pozniak

- 134—RUKAVINA, J. & DELIĆ, S., 1959. [Zavod za parazitologiju i invazione bolesti Veterinarskog fakulteta Univerziteta u Sarajevu, Yugoslavia.] “*Cyathocephalus truncatus* kod riba u nekim vodama Bosne i Hercegovine.” **Veterinaria. Sarajevo**, 8 (3/4), 547–553. [English summary p. 547.]

Rukavina & Delić examined, for *Cyathocephalus truncatus*, 1,226 fish from 11 rivers of the Adriatic conflux and from 15 rivers and one fish pond of the Black Sea conflux, during 1955–59. *Salmo trutta* m. *fario* and *Salmothymus obtusirostris oxyrhynchus* were found to be infected in the Adriatic conflux and *Salmo trutta* m. *fario* and *Thymallus thymallus* in the Black Sea conflux. The incidence of infection reached 77% and was highest in the upper courses of the rivers. In the rivers of the Black Sea conflux simultaneous infections with *C. truncatus* and acanthocephalans were observed. No case of *Cyathocephalus* was found in *Leuciscus cephalus*, *Cyprinus carpio*, *Chondrostoma nasus*, *Salmo hucho*, *Cottus gobio*, *Barbus barbus* and *Leuciscus virgo*.

N. Jones

Marine Fisheries

- 135—ENGELBRECHT, H., 1957. “Über die Häufigkeit des *Echinorhynchus gadi* (Zoega) Müller 1776 in Dorschen (*Gadus morrhua* L.) der Ostsee sowie seine Längenkorrelation zu den Wirtsfischen.” **Wissenschaftliche Zeitschrift der Ernst Moritz Arndt-Universität Greifswald. Mathematisch-Naturwissenschaftliche Reihe**, 6 (5/6), 385–389.

All but one of 92 *Gadus morrhua* caught in the Baltic Sea were heavily infected with *Echinorhynchus gadi*. The infections rose with the age of the fish to a peak in three-year-olds and there was a correlation between the size of the host and that of the parasite. The average

size was 19.7 mm.; males longer than 20 mm. were rare. The females died following egg-laying in the winter months, their maximum life-span being estimated as one-and-a-quarter years. In spite of the high degree of infection no marked lesions, loss of weight or depression in the development of the fish was seen.

G. I. Pozniak

- 136**—IVERSEN, E. S. & HOVEN, E. E., 1958. [P.O. Box 3830, Honolulu, Hawaii.] "Some trematodes of fishes from the Central Equatorial Pacific." **Pacific Science**, **Honolulu**, **12** (2), 131-134. Iversen & Hoven record the following species of trematodes from fishes captured in the vicinity of the Line Islands (Christmas, Fanning, Washington and Palmyra Islands, and Kingman reef) extending in a north-westerly direction from latitude 2°N., longitude 157°W. to latitude 6°N., longitude 163°W. Monogenea found were: *Neothoracocotyle acanthocybii* from gill filaments of *Acanthocybium solandri*; *Capsala poeyi* from the outside surface on the isthmus and second dorsal fin of *Makaira ampla*; *C. biparasitica* firmly attached to the carapace of copepods (*Elytrophora* sp.) found on the gills of *Neothunnus macropterus*; and *Hexostoma grossum* from the gills of *Parathunnus sibi*. Digenetic trematodes found were: *Hirudinella marina* from the stomach of *Neothunnus macropterus*; *H. ventricosa* from the stomach of *Acanthocybium solandri*; *Didymocystis acanthocybii* encysted at the base of the gill arches and on the operculum of *A. solandri*; and *Didymocystis* sp. on the gill filaments of *N. macropterus*. The authors suggest that these host parasite records, especially of the Monogenea, indicate that the stocks of the fish hosts from various areas in the Pacific and Atlantic are not, or were not, completely independent.

E. I. Sillman

- 137**—SIDDIQI, A. H. & CABLE, R. M., 1959. [Purdue University, U.S.A.] "Digenetic trematodes of marine fishes from the Caribbean Sea adjacent to Puerto Rico and Mona Island." [Abstract.] **Journal of Parasitology**, **45** (4, Sect. 2), 35.

Miscellaneous

- 138**—KRUSE, D. N., 1959. [Florida State University, U.S.A.] "Parasites of commercial shrimp." [Abstract.] **Journal of Parasitology**, **45** (4, Sect. 2), 31-32.

- 139**—PROST, M., 1959. [Katedra Parazytologii, Wyższa Szkoła Rolnicza, Lublin, Akademicka II, Poland.] "Badania nad wpływem zasolenia wody na faunę Monogenoidea ryb." **Acta Parasitologica Polonica**, **7** (23/35), 615-630. [English summary p. 630.]

Studying the monogenoidean fauna of fish in waters varying in salinity from that of fresh-water sections of the Vistula to that of the Baltic, Prost was able to confirm the unfavourable effect of salinity on the fauna. The Wislany Zalew (Vistula Bay) was an exception, and Prost suggests that this is due to an adaptation of the fish hosts and their parasites to the existing salinity. The reaction of different Monogenoidea varied; *Diplozoon paradoxum*, *Dactylogyrus difformis* and, to some extent, *D. crucifer* exhibited a considerable degree of tolerance to salinity. The noxious effect is due to the concentration in the water of sulphates as well as chlorides.

G. I. Pozniak

NEMATODOLOGY

Free-Living Nematoda

- 140**—ALLGÉN, C. A., 1958. [Stallmästgatan 21c, Malmö V, Sweden.] "Zwei weitere Fälle von Bisexualität bei schwedischen freilebenden marinen Nematoden." **Zoologischer Anzeiger**, **161** (11/12), 317-319.

Allgén reports two cases of intersexuality in marine nematodes from Gullmarfjord, Sweden: *Rhabdodemania scandinavica* Schuurmans Stekhoven and *Sphaerolaimus latilaimus* n.sp. [described as a new species in another publication]. No figures are given.

R. W. Timm

Plant-Parasitic Nematoda

- 141**—ANON., 1959. [Experiment Station, Hawaiian Sugar Planters Association, Hawaii.] "Effects of nematodes and fungi, singly and in combination, on the growth of sugar cane." **Report. Hawaiian Sugar Planters' Association Experiment Station**, Year 1959, pp. 18-20.
Pot tests with pure populations of *Helicotylenchus nanus*, *Meloidogyne incognita* var. *acrita* and *Trichodorus* sp. showed that these nematodes caused reduction in sugar-cane growth. No evidence was obtained that a nematode-fungus complex existed between *H. nanus* and *M. incognita* var. *acrita* and the root-rot fungus *Pythium graminicolum*. Fumigation with methyl bromide produced better top and root development. H. R. Wallace
- 142**—BRENIÈRE, J., 1959. "Les insectes nuisibles au tabac à Madagascar." **Bulletin. Institut de Recherches Agronomiques de Madagascar**, No. 3, pp. 102-146.
Three pages are devoted to a description of the symptoms of root-knot disease of tobacco, caused by *Meloidogyne javanica*, and its control. All tobacco-growing areas of Madagascar are affected. Control may be attempted by the use of nematicides, by improvement of cultural conditions and by rotation with crops resistant to the nematode. The nematicides mentioned are D-D, EDB and methyl bromide. All tobacco seed-beds should be treated as they are a frequent source of spread of infection. M. T. Franklin
- 143**—CAVENESS, F. E., 1958. [Department of Plant Pathology, South Dakota State College, Brookings, South Dakota, U.S.A.] "Population density gradients of the sugar beet nematode, *Heterodera schachtii*." **Journal of the American Society of Sugar Beet Technologists**, **10** (3), 232-236.
At low population densities the *Heterodera schachtii* population density gradient increased from the apparent centre of an infested area to unaffected areas of the sugar-beet field. At high population densities, however, the gradient decreased from the apparent centre of infestation. Caveness suggests that variations of the total soil nematode population densities may be dominated by populations of plant-parasitic nematodes. H. R. Wallace
- 144**—FINKNER, R. E. & SWINK, J. F., 1959. "Reaction of galactinol selected beet varieties in breeding for nematode resistance." **Journal of the American Society of Sugar Beet Technologists**, **10** (5), 403-423.
Experiments with five varieties of sugar-beet grown in soil heavily and lightly infected with sugar-beet eelworm, showed that weight and sucrose percentage varied inversely as galactinol content. Data from experiments conducted at Dr. Rietberg's laboratory on the relationship between galactinol content of sugar-beet roots and the number of cysts formed on the roots and the degree of wilting are also given. Finkner & Swink state that these results show that the roots with low galactinol content have fewer beet eelworm cysts than roots with high galactinol content. It is also suggested that the degree of wilting caused by a suspension of nematode larvae in water is greatest on roots with high galactinol content. It is emphasized that considerably more experimental work is needed to verify or reject the proposed hypothesis that low galactinol beets are more resistant to sugar-beet eelworm than high galactinol beets. H. R. Wallace
- 145**—JOHNSON, E. M., CHAPMAN, R. A. & VALLEAU, W. D., 1960. [Kentucky Agricultural Experiment Station, Lexington, Kentucky, U.S.A.] "Occurrence of certain plant diseases in Kentucky in 1959." **Plant Disease Reporter**, **44** (3), 159-161.
Johnson *et al.* briefly mention that *Meloidogyne incognita* infected roots of tomato plants growing in plastic green-houses and was also found on poorly growing tobacco plants in the field. D. J. Hooper
- 146**—KHAN, S. A., 1960. [Louisiana State University, U.S.A.] "Studies on *Pratylenchus zeae* (Nematoda, Tylenchida) on sugarcane in Louisiana." **Dissertation Abstracts**, **20** (7), 2483.

- 147—KLEYBURG, P. & OOSTENBRINK, M., 1959. [Plantenziektenkundige Dienst/Landbouwhogeschool, Wageningen, Netherlands.] "Nematodes in relation to plant growth. I. The nematode distribution pattern of typical farms and nurseries." **Netherlands Journal of Agricultural Science**, 7 (4), 327-343.

The distribution of nematodes in fields on ten farms was influenced by soil type, cropping and manuring. The total number of active nematodes per 100 ml. of soil ranged from 1,005 to 16,105 with an average of 3,004. Known and suspected phytophagous nematodes ranged from 120 to 3,510 per 100 ml. of soil with an average of 909. The prevalent phytophagous genera were *Heterodera*, *Paratylenchus*, *Pratylenchus*, *Rotylenchus*, *Tylenchorhynchus* and *Meloidogyne*. The authors suggest that such surveys are a starting point for further research into several obscure crop husbandry problems.

H. R. Wallace

- 148—MARTIN, W. J., 1960. [Dept. of Plant Pathology, Louisiana State University, Baton Rouge, Louisiana, U.S.A.] "The reniform nematode may be a serious pest of the sweetpotato." **Plant Disease Reporter**, 44 (3), 216.

Martin describes experiments which establish that the reniform nematode (*Rotylenchulus reniformis*) may cause severe damage to the sweet-potato (*Ipomoea batatas*) and records the areas from which this nematode is known.

A. M. Shepherd

- 149—TOLER, R. W., CUELLAR, R. & FERRER, J. B., 1959. [Dept. of Plant Pathology, North Carolina State College, Raleigh, North Carolina, U.S.A.] "Preliminary survey of plant diseases in the Republic of Panama, 1955-1958." **Plant Disease Reporter**, 43 (11), 1201-1203.

Plant-parasitic nematodes encountered during this survey included severe infections of *Meloidogyne* sp. on *Cucumis melo*, *Coffea arabica*, *Vigna sinensis*, *Cucumis sativus* and *Citrullus vulgaris*. Lighter infections occurred on banana, *Capsicum* spp. and *Arachis hypogaea*. There were severe infections of *M. incognita* on *Solanum melongena* and *Nicotiana tabacum* and a light attack on *S. tuberosum*. *Aphelenchoides oryzae* was found on rice and *A. cocophilus* on *Cocos nucifera*. *Tylenchorhynchus* sp., *Helicotylenchus* sp., *Trichodorus* spp. and *Xiphinema* spp. were encountered on several crops but their effect was not ascertained except for *Pratylenchus* sp. on *Coffea arabica* where it was considered severe in nurseries.

D. J. Hooper

- 150—VAN DER LINDE, W. J., CLEMITSON, J. G. & CROUS, M. E., 1959. [Division of Entomology, Department of Agricultural Technical Services, Pretoria, South Africa.] "Host-parasite relationships of South African root-knot eelworms (*Meloidogyne* spp.)." **Science Bulletin. Department of Agricultural Technical Services, Union of South Africa**, No. 385, 16 pp.

In comparable host-parasite relationship tests 65 species and, in certain cases, several varieties also of plants were exposed to infection by single populations of *Meloidogyne javanica*, *M. hapla* and *M. arenaria* subsp. *thamesii* and 11 populations of *M. incognita* var. *acrita*. *M. acronea*, the fifth species of root-knot nematode to be recorded from the Union of South Africa, because it occupies an uncertain position in the genus, is merely given mention. Disease Index symbols are included as are also details of the technique used.

G. C. Martin

- 151—WHITE, L. V., 1960. [University of Wisconsin, U.S.A.] "Host-parasite relationship of *Xiphinema americanum* Cobb, 1913, on apple, corn, and strawberry." **Dissertation Abstracts**, 20 (10), 3919.

- 152—WICKENS, G. M. & LOGAN, C., 1960. [Ukiriguru, Lake Province, Tanganyika.] "Fusarium wilt and root knot of cotton in Uganda." **Empire Cotton Growing Review**, 37 (1), 15-25.

A limited survey of cotton-growing districts in Uganda showed that root-knot due to *Meloidogyne incognita*, possibly var. *acrita*, was wide-spread in Bukedi district of the Eastern Province of Uganda while Fusarium wilt (due to *Fusarium oxysporum* f. *vasinfectum*) was restricted to a smaller area. Root-knot disease was also found on cotton in Busoga district at the only other known site of Fusarium wilt. Fusarium was found only in plants with root-knot symptoms. It is pointed out that root-knot may intensify Fusarium wilt disease and that measures to reduce nematode infestation of the soil should be taken in addition to the development of cotton varieties resistant to wilt.

M. T. Franklin

Insect-Parasitic Nematoda

- 153—BINDRA, O. S. & KITTUR, S. U., 1957. [Agricultural Research Institute, Gwalior, India.] "A note on the nematode *Mermis indica* v. Linstow parasitising insects." **Journal of the Bombay Natural History Society**, 54 (3), 796.

Mermis indica v. Linstow was found parasitizing caterpillars of *Amsacta moorei* Butler form sara, and *Cirphis* sp. (Lepidoptera: Arctiidae), serious pests of maize and other crops, in the Jhadua District in Madhya Pradesh. Although most parasitized caterpillars harboured only one or two nematodes, one contained 23. H. E. Welch

- 154—MASSEY, C. L., 1960. [Rocky Mountain Forest and Range Experiment Station, Forest Service, USDA, Colorado State University, Fort Collins, Colorado, U.S.A.] "Nematode parasites and associates of the California five-spined engraver, *Ips confusus* (Lec.)." **Proceedings of the Helminthological Society of Washington**, 27 (1), 14-22.

A new endoparasite, *Aphelenchulus elongatus*, and two parasites, *Parasitaphelenchus* sp. and *Rhabditis obtusa* Fuchs, were described from larvae, pupae and adults of *Ips confusus* (Lec.) (Coleoptera: Scolytidae) collected in New Mexico. *A. elongatus*, present in the haemocoel, almost halved the egg-laying and brood-producing potential of the host. Infection of beetle progeny is greater when both adults, or only the females, are infected than when the male is the only parasitized adult. Egg galleries of infected beetles were almost half the length of those of uninfected beetles. *Parasitaphelenchus* sp. apparently caused no harm to the host. Two new species, *Aphelenchulus gallagheri* and *Diplogaster bandelieri*, and four known species, *Cryptaphelenchus latus* (Thorne) Rühm, *Laimaphelenchus penardi* (Steiner) Filipjev & Schuurmans Stekhoven, *Macrolaimus taurus* Thorne, and *Rhabditis obtusa* were collected from the egg and larval galleries. H. E. Welch

Nematoda Parasitic in other Invertebrates

- 155—OGREN, R. E., 1959. [Dickinson College, Carlisle, Pennsylvania, U.S.A.] "The nematode *Cosmocercoides dukae* as a parasite of the slug." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 45.

Control

- 156—HIROTA, K. & YAMADA, T., 1958. [Yasugawa Plant, Sankyo Co. Ltd., Yasucho, Shiga Prefecture, Japan.] [Effects of anionic surfactants to the nematocide. Studies on supplements of pesticides. XVI.] **Botyu-Kagaku. Kyoto**, 23 (4), 227-229. [In Japanese: English summary p. 229.]

Hirota & Yamada tested the nematocidal action of octylchlororesorcinol (O.C.R.) and dialkyl sodium sulphosuccinates on *Aphelenchoides besseyi* on rice by using the surfactants of alkyl groups. O.C.R. was more effective at between 0.1% and 0.001% concentration of dibutyl and di-isoamyl esters than O.C.R. alone, and less effect was shown by increased concentrations of the surfactants, with almost no effect at 1% surfactants. O.C.R. decreased its effect with the surfactants, 2-ethyl hexyl, iso-octyl, decyl, lauryl and oleyl. It was found that the nematode mortality increased on or above 12 HLB value (Hydrophyl Lypophyl Balance) of the surfactants tested. M. Ichinohe

- 157—LEAR, B. & RASKI, D. J., 1959. "Root-knot nematode survival in excised grape roots in soil fumigated with ethylene dibromide." [Abstract of paper presented at the 51st Annual Meeting of the American Phytopathological Society, University Park, Pa., August 31 to September 2, 1959.] **Phytopathology**, 49 (9), 543-544.

Lear & Raski describe experiments carried out with excised grape roots infested with *Meloidogyne incognita* var. *acrita* to determine the survival of the nematodes in these roots when placed in sterile soil. Under these conditions nematodes in unchopped roots had a high rate of survival after one year, as shown by galls. For roots chopped to hasten decomposition, the high rate of survival lasted only four to eight months. When fumigation with ethylene dibromide was used the high rate of survival lasted eight months for unchopped roots and two months for chopped roots. J. E. Peachey

- 158—NUSBAUM, C. J., 1959. "Effects of cultural practices following tobacco harvest upon root-knot nematode populations." [Abstract of paper presented at the 51st Annual Meeting of the American Phytopathological Society, University Park, Pa., August 31 to September 2, 1959.] **Phytopathology**, 49 (9), 547-548.

Nusbaum has studied the effect of post-harvest cultural practices upon *Meloidogyne incognita* and *M. incognita* var. *acrita* populations. Tobacco roots left undisturbed in the soil after harvest favoured the autumn build up and overwintering of root-knot. Ploughing out, disking or the sowing of small grain crops after ploughing or disking left populations in the following spring less than one-tenth those of untreated plots, with consequent lower infestation and improved performance of the subsequent tobacco crop.

J. E. Peachey

- 159—PIECZARKA, S. J., 1960. [Purdue University, U.S.A.] "Effect of surface seals on the diffusion patterns of soil fumigants." **Dissertation Abstracts**, 21 (1), 18-19.

- 160—TAYLOR, A. L., 1959. "Progress in chemical control of nematodes." In: Holton, C. S. et al. [Editors], "Plant pathology: problems and progress 1908-1958". **Madison: University of Wisconsin Press**, pp. 427-434.

Taylor reviews the developments in the use of chemicals for the control of plant-parasitic nematodes, from the use of carbon disulphide and the discovery of D-D to the testing of new experimental compounds. The author points out that only 0.5% of the 300 million crop-growing acres in the U.S.A. are treated with nematicides. In addition to the need for better materials for field application, chemical treatments for perennial plants and for planting material would also be welcome.

J. E. Peachey

- 161—TURNER, G. O., 1960. [Dow Chemical Co. Agricultural Research Laboratory, Seal Beach, California, U.S.A.] "Trizone, a new triple action soil fumigant." **Down to Earth. Midland, Michigan**, 15 (4), 2-5, 24.

Turner describes a nematocidal formulation of 61% methyl bromide, 31% chloropicrin and 8% propargyl bromide, marketed in cylinders under the trade name Trizone. The product is claimed to exhibit the combined effect of its constituents, in being a nematicide, fungicide and herbicide. It is recommended at rates of 140 to 200 lb. per acre for seed-bed and nursery use, injected to a depth of 6 in. at 12 in. centres and covered by a gas-tight tarpaulin as soon as possible after treatment. Tractor mounted machinery for the whole operation is illustrated. Yield increases, greater than those obtained by either of the main constituents used singly, are recorded.

J. E. Peachey

- 162—VISSER, T., 1959. [Tea Research Institute, Talawakelle, Ceylon.] "Observations on the prevalence and control of parasitic eelworms in tea." **Tea Quarterly. Tea Research Institute of Ceylon**, 30 (2), 96-107.

Visser comments on previous reports of nematodes on tea in Ceylon. The meadow eelworm, *Pratylenchus coffeae*, is a serious pest of seedling and mature tea especially in up-country regions. Results of several experiments show the adverse effect on cropping by *P. coffeae*. Fumigation of mature tea with Nemagon favourably affected subsequent tea yield, but for a limited time only. Root-knot eelworms, especially *Meloidogyne javanica* and *M. brevicauda* occur in tea soils. The former is wide-spread and represents a threat to seedlings but established plants are little affected. The latter causes severe damage on mature tea but is limited to a few estates. Organic matter added to the soil gave a reduction in the effects of eelworm infection on tea plantings. The cultivation of marigolds (*Tagetes* spp.) promises to be an effective means of nematode control in nursery and fallow tea soil. Most of the cover crops, shade trees and green manures associated with tea cultivation appear to be immune to *P. coffeae* and only slightly susceptible to root-knot eelworm, with the exception of *Tephrosia vogellii* which is susceptible to both eelworms.

D. J. Hooper

- 163—WARREN, L. E., 1960. [Dow Chemical Co., Agricultural Chemicals Research, Sacramento Field Station, California, U.S.A.] "Response of established Tokay grapes to soil fumigants." **Down to Earth. Midland, Michigan**, 15 (4), 13-16.

Warren mentions the problems caused by *Meloidogyne* spp., *Pratylenchus vulnus* and *Xiphinema index* in vineyards. Ethylene dibromide (Dowfume W-85) and dibromochloropropane

(Fumazone) were applied as treatments for established vines suffering from root-knot. Conventional injection techniques are found to be acceptable under certain soil conditions whereas emulsifiable applications in irrigation water are considered to be as efficient under a wider range of conditions. After treatment the eelworms build up again within two or three seasons. Optimum control can be expected with a combination of pre- and post-planting treatments correctly timed.

J. E. Peachey

Miscellaneous

- 164—THORNE, G. & ALLEN, M. W., 1959. [Department of Plant Pathology, University of Wisconsin, Madison, Wisconsin, U.S.A.] "Variation in nematodes." In: Holton, C. S. et al. [Editors], "Plant pathology: problems and progress 1908-1958." **Madison: University of Wisconsin Press**, pp. 412-418.

Thorne & Allen draw attention to the importance, in studying morphological and physiological variations, of examining populations from different habitats and localities, so that the full range of intraspecific variability may be appreciated. They distinguish genetic variations, such as the morphological variability of certain species of *Meloidogyne*, *Pratylenchus* and *Diplogaster* and the host-range variability within *Ditylenchus dipsaci* and certain *Heterodera* and *Meloidogyne* species, from non-genetic variations such as size and shape differences in *D. destructor* and *Agamermis decaudata*, lateral line changes in *Anguina*, *Ditylenchus* and *Pratylenchus* and tail variability and other aberrations in various nematodes. [Surprisingly, sex ratio variations in *Meloidogyne* and *Mermis* are regarded here as genetic, whereas the giant race of *D. dipsaci* from broad bean is cited as an example of non-genetic variation.] Failure to detect mixtures of species, faulty processing and mounting, and incorrect calibration in measurement may lead to misinterpretation.

R. D. Winslow

TAXONOMY

Monogenea

- 165—HARGIS, Jr., W. J., 1959. [Virginia Fisheries Laboratory, Gloucester Point, Virginia, U.S.A.] "Systematic notes on the monogenetic trematodes." **Proceedings of the Helminthological Society of Washington**, 26 (1), 14-31.

Hargis discusses briefly our present knowledge of the biology and taxonomy of the Monogenea of fish and considers the terminology of the clamp sclerites. In the Dicliphoroidea the clamp sclerites are of phylogenetic importance. It is concluded that asymmetry is controlled genetically throughout the Monogenea. *Vallisia* and *Winkenthughesia* were placed by Bikhovski (1957) in the Anthocotylidae Bikhovski, 1957 but should be in the Vallisiinae of the Gastrocotylidae. *Dicliphora lintoni* Koratha, 1955 and *D. caudalis* Koratha, 1955 are transferred to *Clupeocotyle* and *Choricotyle* respectively as new combinations. *Dionchus hopkinsi* Koratha, 1955 is a synonym of *D. rachycentria* Hargis, 1955 and *Pseudaxine texana* Koratha, 1955 of *P. mexicana* Meserve, 1938.

S. Willmott

- 166—PRICE, E. W., 1959. [Jacksonville State College, Jacksonville, Alabama, U.S.A.] "A proposed reclassification of the gastrocotylid Monogenea." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 22-23.

- 167—TRIPATHI, Y. R., 1959. [Central Inland Fisheries Research Station, Tungabhadra-Dam, India.] "Monogenetic trematodes from fishes of India." **Indian Journal of Helminthology**, Year 1957, 9 (1/2), 1-149.

Gyrodactylus elegans indicus n.subsp. occurred on the skin near the opercular opening of *Labeo rohita*, *Cirrhina mrigala*, *C. reba* and *Catla catla*. The new form is distinguished from all other subspecies of *G. elegans* by the size of its anchors, pharynx and marginal hooklets. This is the first Indian record of *Gyrodactylus*. *G. medius norai* nom.nov. is proposed for *Gyrodactylus* sp.

of Sproston, 1946 (from *Pleuronectes platessa*). Under *G. elegans*, *G. medius* and *G. rarus* numerous subspecies are listed as new combinations. Measurements are tabulated and pathogenicity and control discussed. *Dactylogyrus boli* n.sp. from *Raimas bola* is characterized by its cirrus, accessory piece and anchors. *D. chagunionis* n.sp. from *Barbus chagunio* is characterized by its cirrus, accessory piece and the shape of the anchor and haptor. *D. longicirrus* n.sp. occurred on *Puntius ticto* and *P. stigma*; its distinguishing characters are the shape of the haptor, the anchors and the V-shaped haptoral bar; *D. macracanthus* n.sp. from the same two hosts has a characteristically shaped haptor, anchors and haptoral bar. *D. sarani* n.sp. from *P. sarana* has a laterally lobed head and a haptoral bar shaped like a "Y" inserted in another "Y". *D. gobii* n.sp. from *Glossogobius giuris* has a cirrus and anchors which differ from those of all other species of the genus. *D. cauveryi* n.sp. from *P. dubius* possesses a distinctive long flagellum-like cirrus. *D. kontii* n.sp. from *Labeo kontius* is characterized by its long cirrus and broad based anchors. *D. (Paradactylogyrus) bati* n.sp. from *L. bata* resembles *D. (P.) catlaini* but the position of the "oncidium" and the structure and size of the anchors differ. *Tribaculo cauda discoidea* n.g., n.sp., which was found on *Hemiramphus georgii*, differs from all known genera of the Tetraonchinae in the shape of body, haptor and cirrus. *Bagaritrema son* n.g., n.sp. from *Bagarius bagarius* has very markedly unequal and characteristically shaped anchors and three haptoral bars, the intestinal crura unite posteriorly and the vagina is curiously shaped. *Neomurraytrema tengra* n.g., n.sp. was found on *Mystus gulio*; it resembles *Murraytrema* and *Tribaculo cauda* in having three separate bars on the haptor but differs in their shape and in the shape of the body and cirrus. *Silonditrema cauveryi* n.g., n.sp. from *Silondia silundia* is characterized by the structure of its haptor. *Silonditrema gharui* n.sp. from *Clupisoma garua* differs from *S. cauveryi* in the shape of the cirrus, vagina and ventral pair of anchors. *S. vacha* n.sp. from *Eutropiichthys vacha* differs from the two other species of the genus in the shape of the cirrus, the trapezoid cuticular plate of the haptor and the relative size of the anchors. *Wallagotrema longicirrus* n.g., n.sp. from *Wallagonia attu* is distinguished from *Silonditrema*, *Bagaritrema*, *Neomurraytrema* and *Hargitrema* n.g. (all of which it resembles in having three bars and unequal anchors) by the absence of an accessory piece. *Haliotrema indicum* n.sp. from *Platycephalus insidiator*, resembles *H. platycephali* most closely but differs in that the new species has a frayed margin to the vagina. *Ancyrocephalus uniccirrus* n.sp. from *Pomadasy maculatum* is characterized by the shape of the cirrus and absence of accessory piece; glands connected with the anchors are present. *A. pseudorhombi* n.sp. from *Pseudorhombus triocellatus* resembles *A. uniccirrus* but has a differently shaped cirrus. *A. bam* n.sp. from *Rhynchobdella aculeata* is distinguished by its cirrus and unequal anchors. *A. johnei* n.sp. from *Lutjanus johni* has a characteristically shaped cirrus. *A. triacanthi* n.sp. from *Triacanthus brevirostris* is similar in body and cirrus shape to *A. platycephali* but the attachment of the muscle bands in the posterior part of the body differs and the vaginal opening is a small cuticularized tube. *A. nengi* n.sp. from *Arius nenga*, *A. arius* and *Osteogeneosus militaris* resembles *Haematopoduncularia arii* Yamaguti, 1953 and this genus is regarded as a synonym of *Ancyrocephalus*; the cirrus in *A. nengi* is curved and lacks muscle fibres whereas in *A. arii* it is straight with a coat of muscle fibres. *Haploclaidus pangasi* n.sp. from *Pangasius pangasius* may be distinguished by the shape of its anchors and cirrus. *H. vachi* n.sp. from *Eutropiichthys vacha* differs from all other species of the genus in the cap-shaped accessory piece. *Actinocleidus leiognathi* n.sp. from *Leiognathus edentulus* is characterized by the shape of the anchors and cirrus. *Ancylo discoides mugilis* n.sp. from *Mugil subviridis* is characterized by its small ovary, pedunculated haptor and cirrus. *Lobotrema madrasi* n.g., n.sp. occurred on *Brachiurus orientalis* and is characterized by the presence of two similar transverse bars, the intestinal crura not joining posteriorly and the presence of a vagina. *Haematopoduncularia bagrae* is transferred to *Hargitrema* n.g. *Neocalceostoma elongatum* n.g., n.sp. from *Osteogeneosus militaris* and *Arius arius* resembles *Calceostomella* in the form of the genital organs but differs from it in the haptor which is muscular, cup-like with one pair of anchors and ten marginal hooklets. *Tympanocirrus spirophallus* n.g., n.sp. from *Dasyatis (Pastinachus) sephen* is nearest to *Monocotyle* and *Heterocotyle*. *Horricauda rhynchobatis* n.g., n.sp. from *Rhynchobatus djiddensis* is characterized by having head organs, the haptor with seven marginal loculi and peculiar cuticular plates on its dorsal side. *Encotyllabe lutjani* n.sp.

from *Lutjanus johni* differs from other species of the genus in the ratio of the lengths of the two anchors—6 : 1. Loimoninae is removed from the Monocotyliidae and raised to family rank. *Mazocraes gonialosae* n.sp. was found on *Gonialosa manmina*; it is smaller than European species but longer than *M. orientalis* although the latter has a longer lappet; *Mazocraeoides gonialosae* n.sp. from the same host and *M. nematolosa* n.sp. from *Nematolosa nasus* are distinguished from other species of the genus by various morphological characters. *Neomazocraes anadontostomae* n.sp. from *Anadontostoma chacunda* differs from the type species in the number of cirrus hooks. *N. nematolosi* n.sp. [host not given] resembles *N. dorosomatis* but the egg in the new form has a broad appendage. *Kuhnna indica* n.sp. from *Cybium guttatum* differs from the other four species in the number of cirrus hooks, the size of the oral suckers and the smaller haptor. *Paramazocraes thrissocles* n.g., n.sp. from *Thrissocles mystax* has palmate genital hooks, unequal clamps and a long lappet, all the clamps being permanently open; *P. phasae* n.sp. from *Seitipinna phasa* differs from the type species in having only two clamps larger than the others and the smaller of the “closed” type. *Indomazocraes jagannath* n.g., n.sp. from *Rastrelliger kanagurata* is characterized by the structure of the haptor and the arrangement of the genital hooks. Diplozoidae n.fam. is proposed for *Diplozoon* and *Diplozema* n.g. *Diplozoon soni* n.sp. is described from *Oxygaster bacaila* and is differentiated on its small size, shape of the egg, diverticula of its intestine and the ratio of the area of the first and fourth clamp. *D. cauveryi* n.sp. from *Cirrhitina cirrhosa* is characterized by the reticulate intestine and the egg which lacks filaments. *Diplozema barbi* n.g., n.sp. occurred on *Barbus chagunio*; it resembles *Diplozoon* in all respects except the bilobed haptor which has 18 to 28 pairs of clamps. Discocotyliidae is emended and includes a new subfamily Indocotylinae erected for *Indocotyle hemirhamphi* n.g., n.sp. from *Hemiramphus georgii*. *Indocotyle* differs from all other genera of the family in the shape of its oblique linear haptor. Alladiscocotyliidae n.fam. is proposed to contain Vallisiinae and Alladiscocotylinae n.subf. which has the body and haptor symmetrical. *Alladiscocotyle* is the type of the new subfamily which contains also *Gemmaecaputia corrugata* n.g., n.sp. from *Sphyraena obtusata*; the new genus is characterized by the relative position of the testes and ovary, the absence of anchors, clamps with accessory sclerites and the unarmed vagina and cirrus. *Diclidophora indica* n.sp. from *Tetraodon oblongus* is characterized by its sessile clamps which diminish in size posteriorly and the presence of many eggs in the uterus. *Microcotyle madrasii* n.sp. from *Pseudosciaena diacanthus* has a characteristic armature in the genital atrium. *M. leiognathi* n.sp. from *Leiognathus ruconius* resembles *M. mouzoi* but differs in the number and size of the clamps and the testes. *Axine hemirhamphae* n.sp. from *Hemiramphus georgii* differs from all other *Axine* species in having fewer spines in the genital atrium. *Heteraxine minuta* n.sp. from *Megalaspis cordyla* is characterized by the small body size and having fewer cirrus hooks and clamps. *Gastrocotyle thrissocles* n.sp. from *Thrissocles mystax* is peculiar in having two small clamps on the other side of the haptor near the anchors. *Thoracocotyle ovalis* is given as nom. emend. [for *T. ovale* Tripathi, 1956]. The taxonomy of the Monogenea is discussed in detail and various alterations and emendations are proposed. The paper is illustrated by line drawings and tables and numerous keys are provided.

S. Willmott

- 168—UNNITHAN, R. V., 1957. [Marine Biological Laboratory, Trivandrum, Kerala, India.] “On the fundamental morphology of a new fauna of Monogenea on fishes from Trivandrum and environs. Part I. Axinidae fam. nov.” *Bulletin of the Central Research Institute of the University of Kerala, Trivandrum. Series C. Natural Sciences*, 5 (2), 27–122.

Unnithan has studied the monogenean fauna from marine fish of the south-east and south-west coasts of India. The macro- and micro-environments, the functional morphology of some organ systems in the Axinidae n.fam. and a number of histochemical observations are discussed. A revised systematic scheme is proposed and the characters considered to be of specific importance are listed. Microcotyloidea n.superf. is erected for Microcotylidae, Axinidae n.fam. and Gastrocotylidae. The Axinidae, which shows secondary differential inhibitions along three posterior growth axes, is divided into three subfamilies, Heteraxininiae n.subf. (type *Heteraxine*), Monaxininiae n.subf. (type *Monaxine* n.g.) and Axininiae n.subf. (type *Axine*). Two new genera of Heteraxininiae are described, namely, *Zeuxapta* n.g. for *Axine seriola* of Meserve, 1938 and *Microcotyle seriola* Yamaguti, 1940

which are conspecific and are renamed *Z. zyxivaginata* nom.nov., and *Kannaphallus virilis* n.g., n.sp. from the gills of *Parastromateus niger*. In Monaxininae four new genera are made, namely, *Monaxine formionis* n.g., n.sp. from the gills of *P. niger*, *Crotalaxine serpentina* n.g., n.sp. from the gills of *Ablennus hians*, *Amonaxine* n.g. for *Axine constricta* Yamaguti, 1938 and *Uraxine chura* n.g., n.sp. from the gills of *Euthymus affinis*; a subspecies *U. chura macrova* n.subsp. of this last-mentioned is also made. In Axininae three new genera are proposed; these are *Loxura ananaphallus* n.g., n.sp. from the gills of *Tylosurus lerurus*, *Oligapta oligapta* n.g., n.sp. from the gills of *Hemiramphus georgii* and *Chlamydxine* n.g. for *Axinoides truncatus* Hargis, 1956. A number of new species are also described—*Heteraxine karavoli* n.sp. from the gills of *Parastromateus niger*, *Axine hemiramphae* n.sp. from the gills of *Hemiramphus xanthopterus*, *A. parawa* n.sp. from the gills of *Cypselurus bahiensis*, *Axinoides kola* n.sp. from the gills of *Ablennus hians*, and *Loxura sasikala* n.sp. from *Cypselurus oligolepis*. *Axine seriola* Ishii, 1936 is transferred to *Zeuxapta* as *Z. seriola* n.comb. All the new forms are described in detail, defined and illustrated by numerous line drawings of the salient features. Strict host specificity was observed.

S. Willmott

Aspidobothria

No relevant abstracts in this issue

Digena

169—CABALLERO y C., E. & GROCOTT, R. G., 1959. [Laboratorio de Helmintología, Escuela Nacional de Ciencias Biológicas, I.P.N., México, D.F.] "Helmintos de la República de Panamá. XXIII. Estudio de dos tremátodos de murciélagos, con descripción de una nueva especie." **Ciencia. Mexico**, 19 (11/12), 244–248. [English summary p. 247.]

Anenterotrema stunkardi n.sp. is described by Caballero & Grocott from the small intestine of *Phyllostomus hastatus panamensis*, found in the caves of Chilibrillo (Panama). The new species differs from *A. auritum* Stunkard, 1938 by the absence of anterior and lateral cephalic papillae on the oral sucker, by the size of the testes and ovary and by the position of the latter. It differs from *A. singulare* by the size, form and the structure of the cirrus pouch, the position of the testes and that of the ovary. The authors also redescribe *Urotrema scabridum* Braun 1900 which they have found in the same host and locality, and they consider *U. aelleni* Baer, 1957 to be a synonym. They base this conclusion on morphological similarity and on the fact that Baer has differentiated these two species only by host and by variations in size. This is the first report on the helminth fauna of bats in Panama. The paper is illustrated with three figures.

N. Jones

170—CHABAUD, A. G. & BUTTNER, A., 1959. [Institut de Parasitologie, Faculté de Médecine de Paris, France.] "Note complémentaire sur le *Bunocotyle* (Trématode Hémiuroïde) de l'étang du Canet." **Vie et Milieu. Paris**, 10 (2), 204–206.

Chabaud & Buttner show that the progenetic metacercaria described by Markowski in 1936 from *Hydrobia ventrosa* (= *stagnalis*) in the Baltic is a species of *Bunocotyle*, not of *Monorchis*; it therefore becomes *B. progenetica* n.comb. and represents a life-history with only one host. Cystophorous cercariae from *H. stagnalis* from l'Etang du Canet (Mediterranean) develop into progenetic metacercariae in the copepod *Popella guernei*; no *Bunocotyle* metacercariae were found in molluscs and no adults in fish in this area; this form is named *B. meridionalis* nom.nov. (for *B. cingulata* sensu Chabaud & Biguet, 1954) and represents a two-host cycle. *B. cingulata* Odhner, 1928, which matures in fish, represents the three-host cycle. The three are separated on biological rather than morphological grounds.

S. Willmott

171—CHATTERJI, P. N., 1959. [University of Illinois, U.S.A.] "Two new species of the genus *Xenopharynx* Nicoll, 1912 (Digena: Plagiorchiidae)." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 60.

- 172—CHENG, T. C., 1959. [Department of Histology and Embryology, University of Maryland Dental School, Baltimore, Maryland, U.S.A.] "The description of *Acanthatrium beuschleini* n.sp., a new trematode parasite of bats; and a re-evaluation of the reproductive system of *Acanthatrium sogandaresi* Coil and Kuntz, 1958." *Journal of Parasitology*, 45 (3), 323–326.
- Acanthatrium beuschleini* n.sp. is described and illustrated from *Eptesicus fuscus fuscus* in Albermarle County, Virginia; it is significantly smaller than all other members of the genus except *A. nycterides*, having the average body size 0.246 mm. by 0.18 mm.; the arrangement of the atrial spines in a row distinguishes it from *A. nycterides*. *A. beuschleini* appears to be most closely related to *A. eptesici* and *A. oligacanthum* but its small size and smaller atrial spines differentiate it from the former and the number (11) and size of the atrial spines from the latter. The cuticle of the new species is distinct in being completely spinous. Re-examination of the type of *A. sogandaresi* Coil & Kuntz suggests that the unusual condition of the male genitalia, reported in the original description, was due to the pressure exerted on the specimen; Cheng's observations show that the reproductive structures are arranged as in other members of the genus; this species is, however, distinct in the pattern of its vitellaria. S. Willmott

- 173—CHING, H. L., 1960. [Agricultural Experiment Station, College of Agriculture, University of Hawaii, Honolulu 14, Hawaii.] "Some digenetic trematodes of shore birds at Friday Harbor, Washington." *Proceedings of the Helminthological Society of Washington*, 27 (1), 53–62.
- Ching describes *Plenosoma* n.g. (Microphallidae) and three new species, *P. minimum*, *Gymnophallus obscurus* (Microphallidae), and *Echinostephilla haematopi* (Philophthalmidae) from the intestine of *Haematopus bachmani*, Goose Island, Friday Harbour, Washington. *Plenosoma* resembles *Pseudospelotrema* Yamaguti, 1939 and *Maritreminoides* Yoshida, 1938 in the extent of the uterus into the fore-body, but differs from them in the anterior distribution of the vitellaria, and the presence of a large, muscular genital atrium and a longitudinal genital opening. *Pseudosellacotyla* Yamaguti, 1954 resembles *Plenosoma* in the anterior distribution of the vitellaria, but differs from it in lacking a cirrus sac and possessing a bipartite seminal vesicle and a genital pore opening ventral to the acetabulum. *Levinseniella* Stiles & Hassall, 1902 differs from *Plenosoma* in possessing a more complexly organized genital atrium, and lacking a cirrus sac. *Gymnophallus obscurus* n.sp. resembles *G. macroporus* in the arrangement of the vitellaria and gonads, but its body and eggs are half the size of those of *G. macroporus*, and its uterus extends anteriorly to the intestinal caeca. *G. obscurus* resembles *Parvatrema borealis* in arrangement and shape of the vitellaria and body and egg size, but its genital pore lies immediately in front of the acetabulum rather than some distance anterior to it. *Echinostephilla haematopi* n.sp. differs from the type and only other species of the genus, *E. virgula* Lebour, 1909 in possessing a tapering anterior end, lacking scales on the posterior third of the body, the ovary being smaller than the testes, and having fewer (10 to 35) vitelline follicles than 40 to 60 on each side. *Skrjabinovermis vesiculata* Belopolskaya, 1953 is placed in synonymy with *E. virgula*, because of the similarity of hosts, body shape, and measurements of body, organs and eggs. The miracidium and immature adult stages of *E. haematopi* are briefly described. The following new host and locality records are noted: *Galactosomum humbargari* from *Larus heermanni*, *L. glaucescens* and *L. philadelphia*; *Cryptocotyle lingua* from *L. glaucescens*; *Levinseniella propinqua* and *Microphallus primas* from *Haematopus bachmani*. E. I. Sillman

- 174—CHING, H. L. & ROBINSON, E. S., 1959. [Zoology Department, University of Nebraska, U.S.A.] "Two campulid trematodes from a new host, the harbor porpoise." *Journal of Parasitology*, 45 (2), 181.
- Ching & Robinson record *Hadwenius nipponicus* Yamaguti, 1950 from the fourth chamber of the stomach of *Phocaena vomerina*. Over 100 specimens were recovered and they differed from Yamaguti's two specimens in the following characters: the smaller size of the body and of the suckers and internal organs, the presence of an intertesticular space, and the vitellaria which extend further forwards. Numerous *Campula oblonga* were present beneath the serous membrane of the liver and in the bile-ducts. Both are new records for this host. S. Willmott

- 175—ERICKSON, D. G. & WALLACE, F. G., 1959. [Department of Zoology, University of Minnesota, Minneapolis, Minnesota, U.S.A.] "Studies on blood flukes of the genus *Sanguinicola*." *Journal of Parasitology*, **45** (3), 310–320, 321–322.

Two *Notropis hudsonius* were experimentally infected with lophocercous cercariae from *Valvata tricarinata*; the adults obtained are described and illustrated as *Sanguinicola lophophora* n.sp. The new form is small (0.296 mm. to 0.525 mm. long by 0.064 mm. to 0.145 mm. wide), has 17 to 18 pairs of testes and the distance from the anterior end of the body to the diverticula of the intestinal caeca is one-third the body length; the sporocyst and cercaria are also described. *Cercaria cristafera* n.sp., is also described and figured; it occurred in *V. tricarinata* but mixed infections of the two species were not found. Fish were exposed to these cercariae and although no adults were found eggs recovered from the gill capillaries of one *N. heterolepis* were of *Sanguinicola* type. A key is given to the species of *Sanguinicola* and the chief characteristics of the various species are tabulated.

S. Willmott

- 176—FISCHTHAL, J. H. & KUNTZ, R. E., 1959. [Department of Biology, Harpur College, State University of New York, Endicott, New York, U.S.A.] "Trematode parasites of fishes from Egypt. Part I. *Basidiiodiscus ectorchis* n.gen., n.sp., and *Sandonia sudanensis* McClelland, 1957 (Paramphistomidae)." *Proceedings of the Helminthological Society of Washington*, **26** (1), 32–37.

Fischthal & Kuntz describe and illustrate *Basidiiodiscus ectorchis* n.g., n.sp. from the small intestine of *Synodontis schall* and *Mormyrus kannume*. The new genus differs from all other paramphistomes from fish in the acetabulum, which is in the form of a pedestal-like appendage much wider than the base of the body, and from all but *Sandonia* in having one testis inter-caecal and the other extracaecal. *Sandonia sudanensis* is redescribed from specimens obtained from *Synodontis schall*.

S. Willmott

- 177—GOODMAN, J. D., 1959. [Department of Biology, University of Redlands, Redlands, California, U.S.A.] "A new name, Macroderinae, for a subfamily of trematodes of natricine snakes, with a redescription of *Distomum variabile* Leidy, 1856." *Transactions of the American Microscopical Society*, **78** (2), 220–227.

Distomum variabile variety *a* Leidy, 1856 is redescribed and illustrated and *Natriodera verlatum* Talbot, 1934 is shown to be identical with it. The name therefore becomes *N. variabile* (Leidy, 1856) n.comb. *Macrodera* (of which there are two species, *M. longicollis* and *M. cantonensis*, parasitizing European and Chinese water snakes respectively) and *Natriodera* (with one species and *Ochestosomatinae* respectively and placed in the Macroderinae subfam.nom.nov. of the Plagiiorchiidae. The Liophistrematinae, parasitic in South American snakes, is the most closely related subfamily and contains the following genera: *Liophistrema* Artigas, Ruiz & Leão, 1942, *Bieria* Leão, 1946, *Glossidiella* Travassos, 1927. *Glossidium loossi* Travassos, 1927 is transferred to *Glossidiella*. *Haplometroides* Odhner, 1911 and *Sticholecitha* Prudhoe, 1949 may also belong to the Liophistrematinae.

S. Willmott

- 178—KOZICKA, J. & NIEWIADOMSKA, K., 1960. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "*Tylodelphys podicipina* sp.n. (Trematoda, Strigeidae) and its life-cycle." *Acta Parasitologica Polonica*, **8** (1/7), 25–36. [Polish summary p. 36.]

Adults of *Tylodelphys podicipina* n.sp. were found in *Podiceps cristatus*, *P. griseigena* and *P. nigricollis* on Lake Mamry Północne, and metacercariae, which were experimentally shown to belong to this species, were found in the eyes of *Perca fluviatilis*, *Acerina cernua* and *Lota lota*. Both are described and figured. *T. podicipina* differs from all other species in this genus by the inverse ratio of the suckers (ventral larger than oral) and the well developed lateral suckers; it further differs from *T. conifera* and *T. clavata* by its larger measurements and the sinistral position of the ovary, and from *T. elongata* by different body proportions and by the fact that the bursa copulatrix opens dorsally and is not well developed. The diagnosis of *Tylodelphys* is emended to include the characters of the new species. *Glossodiplostomum glossoides*, which shows similarities to the new species in the suckers, holdfast and genital glands and now falls within the emended diagnosis of *Tylodelphys*, is included in this genus as a new combination.

G. I. Pozniak

179—LEIGH, W. H., 1959. [University of Miami, U.S.A.] "The fish, *Cyprinodon*, as the intermediate host for a new species of the trematode genus *Ascocotyle*." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 23.

180—MACY, R. W., 1960. [Portland State College, Portland, Oregon, U.S.A.] "The life cycle of *Plagiorchis vespertilionis parorchis*, n.ssp., (Trematoda: Plagiorchidae), and observations on the effects of light on the emergence of the cercaria." **Journal of Parasitology**, 46 (3), 337-345.

Macy describes a new subspecies, *Plagiorchis vespertilionis parorchis*, based on experimental material recovered from *Mus musculus* L. The testicular angle and the small size of the body are the two characters used to separate the new subspecies from other collections of *P. vespertilionis*. Specimens of *Lymnaea stagnalis* L. collected near Washington were found to be shedding xiphidiocercariae of the *Polyadena* group which develop in sporocysts. Cercariae are normally shed at night but shedding could be induced during the daytime by changing periods of illumination. Cercariae were found experimentally to penetrate and encyst in mosquito larvae, caddis-fly larvae, mayfly larvae and dragon-fly nymphs. After seven days the metacercariae proved to be infective when fed to white mice. M. Beverley-Burton

181—MARTIN, W. E., 1958. [Department of Zoology, University of Southern California, Los Angeles, U.S.A.] "Hawaiian helminths 1. *Trigonocryptus conus* n.gen., n.sp. (Trematoda, Fellodistomidae)." **Pacific Science. Honolulu**, 12 (3), 251-254.

Martin describes *Trigonocryptus conus* n.g., n.sp. from the intestines of *Tetraodon hispidus*, collected by trap at Kaneohe Bay, Oahu (Hawaii). The new genus most closely resembles *Paradiscogaster* Yamaguti, 1934 from which it differs in the distribution of the vitellaria in two clusters on each side of the body, extending from the acetabulum to the oral sucker, rather than in one cluster on each side of the body and confined to the caecal region, and in the shape of the oral sucker and the body. *T. conus* has an inverted tail cone, dorsal to the excretory pore, which was never seen everted even in active worms. E. I. Sillman

182—RAO, K. H., 1958. [Department of Zoology, Andhra University, Waltair, India.] "Hemiurid larvae (Trematoda) in the medusa *Aequorea pensilis* (Hackel) from the Bay of Bengal." **Annals and Magazine of Natural History, Series XIII**, 1 (11), 702-704.

Rao describes hemiurid metacercariae from *Aequorea pensilis*. Although the larvae were not fully developed, the characters of one were developed sufficiently to show it probably belonged to the genus *Aponurus*. E. I. Sillman

183—VELASQUEZ, C. C., 1959. [Department of Zoology, University of the Philippines.] "Studies on the family Bucephalidae Poche 1907 (Trematoda) from Philippine food fishes." **Journal of Parasitology**, 45 (2), 135-146, 147.

Thirteen species of Bucephalidae, of which 12 are new to science, are described and illustrated from Philippine food fishes. The new forms are compared with the most closely related species and the morphological characters which distinguish them from them are discussed. They are: *Bucephalus fragilis* n.sp. from *Megalaspis cordyla*, *B. leognathi* n.sp. from *Leiognathus* sp., *B. pseudovaricus* from *Caranx* sp., *B. paraheterotentaculatus* n.sp. from *Seriola nigrofasciata*, *Proisorhynchus paracrucibulus* n.sp. from *Ambassis buruensis*, *P. luzonicus* n.sp. from *Lates calcarifer*, *P. longus* n.sp. from *Psettodes erumei*, *Rhipidocotyle eggletoni* n.sp. from *Sillago sihama* and *Gazza minuta*, *R. laruei* n.sp. from *P. erumei*, *Bucephaloides philippinorum* n.sp. from *Sphyræna langsar*, *Alcicornis cirrudiscoides* n.sp. from *Caranx* sp. and *Neidhartia mcintoshii* n.sp. from *Epinephelus bleekeri*. *Proisorhynchus crucibulus* from *Sparus berda* in Malabon, Rizal, Luzon Island is a new host and geographical record. *Bucephaloides tenuis* n.comb. and *B. exilis* n.comb. are made for *Bucephalopsis tenuis* Yamaguti, 1952 and *B. exilis* Nicoll, 1915 respectively. One of the lectotypes of *Gasterostomum baculum* of Linton (1901, 1905) is designated as syntype of *Rhipidocotyle baculum* (Linton, 1905) Eckmann, 1932. *Bucephalus confusus* nom.nov. is proposed for the specimens with tentacles which Linton (1940) identified wrongly and described and figured as *Nannoenterum baculum*. A single specimen from *Scomberomorus maculatus* from the U.S. Nat. Mus. Helm. Coll. No. 6672, identified by Linton as *Gasterostomum arcuatum* is now entered as *Bucephaloides arcuatus* (?) (Linton) n.comb. S. Willmott

184—YAMAGUTI, S., 1959. [Department of Parasitology, Okayama University Medical School, Okayama, Japan.] "Studies on the helminth fauna of Japan. Part 54. Trematodes of fishes, XIII." **Publications of the Seto Marine Biological Laboratory**, 7 (2), 241–262.

Bucephalus sebastichthydis n.sp. from *Sebastichthys pachycephalus* is characterized by the seven bifurcate tentacular processes of the rhynchus. *Rhipidocotyle sphyraenae* n.sp. from *Sphyraena pinguis* is most closely related to *R. barracudae* but differs in that the apical hood of the rhynchus is provided with seven marginal double papillae. *Dolichoenterum magnum* n.sp. from *Conger conger* is distinguished by its enormous size (16–20 mm. by 1·4–2·0 mm. when fixed). *Decemtestis parapercis* n.sp. from *Parapercis pulchella* resembles *D. callionymi* but its vitellaria are not interrupted at the level of the acetabulum. *Maculifer chilomycteri* n.sp. from *Chilomycterus affinis* is described and figured but not differentiated from allied species. *Plagioporus* (*Plagioporus*) *kyusen* n.sp. from *Halichoeres poecilopterus* is characterized by its small body size (0·65–0·9 mm. by 0·22–0·3 mm. when fixed) and comparatively large egg (59–67 μ by 36–40 μ). *P. (Caudotestis) parapercis* n.sp. from *Parapercis pulchella* differs from *P. (C.) sinitsini*, its closest relative, in species of host and size and shape of the eggs. *Opegaster elongata* n.sp. from *Apogon semilineatus* differs from *O. apogonichthydis* and *O. pentadactyla* in egg size, from the former also in the anterior extent of the vitellaria and from the latter also in the marginal tentacular projections of the acetabulum. *Dereitrema parapriacanthi* n.sp. from *Parapriacanthus beryciformes* resembles *D. pooli* but may be distinguished by the size of the eggs. *Lepidophyllum canthigastris* from *Canthigaster rivulata* is differentiated from *L. steenstrupi* and *L. armatum* by the smooth cuticle, sucker ratio and position of the genital pore, and from the former by other morphological characteristics; the sucker ratio and position of the genital pore and vitellaria distinguish it from *L. brachycladium* and *L. pleuronectini*. *Allolasiotocus nibeae* n.g., n.sp. from *Nibea schlegeli* differs from *Lasiotocus* in having an external seminal vesicle and the cirrus represented by the widest right chamber of the genital atrium. *Pseudoheterolebes* n.g. is proposed for *Heterolebes cotylophorus* Ozaki, 1935; the new genus possesses a conspicuous circumacetabular fold. *P. chilomycteri* n.sp. from *Chilomycterus affinis* differs from *P. cotylophorus* in the position of the ovarian complex behind the acetabulum, between and dorsal to the testes. *Allodidymozoon sphyraenae* n.g., n.sp. from *Sphyraena pinguis* differs from *Didymozoon* and *Didymocystis* in the position of the shell gland complex and in the absence of a seminal receptacle. Additional information on a number of previously described species is also given. S. Willmott

Cestodaria

No relevant abstracts in this issue

Cestoda

185—ROBINSON, E. S., 1959. [University of Nebraska, Department of Zoology, Lincoln 8, Nebraska, U.S.A.] "Some new cestodes from New Zealand marine fishes." **Transactions of the Royal Society of New Zealand**, 86 (3/4), 381–392.

Acanthobothrium wedli n.sp. is described from the spiral valve of *Raja nasuta*. It resembles *A. microcephalum*, the most nearly related species, in total hook length, size of scolex, and number of testes, but in *A. wedli* the strobila is wider, the testes are much larger, accessory suckers are absent, and there is no velum-like fold attaching each bothridium to the neck. In *A. wedli* the hook handle (0·070 mm.), inner prong (0·027 mm.) and outer prong (0·035 mm.) are longer than in *A. microcephalum*. *Echinobothrium coronatum* n.sp. from the spiral valve of *Mustelus lenticulatus* has more proglottides and more hooks (total of 42) with the largest bigger (0·118 mm.) than those on other species in the genus. The testes are comparatively large, up to 0·128 mm. and number 9 to 11 per proglottis. Larvae of *Gymnorhynchus (Molicola) thyrssitae* n.sp. occurred in the muscle of *Thyrssites atun* and other fish. The new form differs from the other species in this subgenus, *G. (M.) horridus*, in having the scolex invaginated in the blastocyst (rather than curved around it) and flattened hook tips in the mid-region of a half-turn of principal hooks. *G. (G.) isuri* n.sp., described and figured, from the spiral valve

of *Isurus glaucus* appears to be the first description of an adult in this subgenus. *Prochristianella aetobatis* n.sp. is described from the spiral valve of *Aetobatis tenuicaudatus*; the proboscides are only half as long as in *P. papillifer*, and the basal armature consists of six rows of hooks arranged in half-turns. G. K. Sweatman

186—RYBICKA, K., 1959. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "Some remarks on the classification of the family Hymenolepididae Fuhrmann, 1907 (Cestoda)." *Acta Parasitologica Polonica*, 7 (23/35), 499–520. [Polish summary p. 520.]

In Spasski's classification of Hymenolepididae from small mammals [for abstract see Helm. Abs., 23, No. 922c] the following evoke doubt: (i) the proposition to use for diagnosis a whole set of characters with an accent on the biology of worms which in many cases is yet insufficiently known; (ii) the erection of a large number of monospecific genera on non-equivalent criteria and with too narrow diagnoses; (iii) the acceptance of the testes pattern as the chief character separating multispecific genera; and (iv) the erection of the tribe Ditestolepea on the strobila form for genera differing in the character of hooks and the number of testes. Rybicka concludes that our knowledge is yet insufficient for a new classification which would satisfactorily reflect the phylogeny of the worms and proceeds to examine which of the diagnostic characters are of basic and which of secondary nature. G. I. Pozniak

Acanthocephala

187—FISHER, Jr., F. M., 1960. "On Acanthocephala of turtles, with the description of *Neoechinorhynchus emyditoides* n.sp." *Journal of Parasitology*, 46 (2), 257–266.

Neoechinorhynchus emyditoides n.sp. is described from several species of North American turtles. This is the fourth species to be recognized from turtles. It most closely resembles *N. emydis* but differs "in the size attained by both sexes, width of the uterus, and characteristics of the eggs". Descriptions of all four species together with data on host and geographical distribution are included. The importance of the contour of the posterior end of the female and the study of living eggs is emphasized. W. L. Bullock

188—YAMAGUTI, S., 1959. [Department of Parasitology, Okayama University Medical School, Okayama, Japan.] "Studies on the helminth fauna of Japan. Part 55. Four new genera of Acanthocephala from fishes." *Publications of the Seto Marine Biological Laboratory*, 7 (3), 319–326.

Yamaguti describes two new genera (*Metacanthocephalus* and *Metacanthocephaloides*) of Echinorhynchidae and two new genera (*Metarhadinorhynchus* and *Allorhadinorhynchus*) of Rhadinorhynchidae. All genera are monotypic and are parasites of marine fish. *Metacanthocephalus* is similar to *Acanthocephalus* but has eight cement glands and the proboscis ganglion is in the anterior portion of the proboscis sheath: the type species is *M. pleuronichthydis* from *Pleuronichthys cornutus*. *Metacanthocephaloides* is similar to *Metacanthocephalus* but has six cement glands and two unique giant cells on either side of the vagina: the type species is *Metacanthocephaloides zebrini* from *Zebrias zebrinus*, *Inegocia meerdervoorti*, *P. cornutus* and *Paralichthys olivaceus*. *Metarhadinorhynchus* is similar to *Rhadinorhynchus* but has eight cement glands: the type species is *M. lateolabracis* from *Lateolabrax japonicus*. *Allorhadinorhynchus* is characterized by a pronounced pseudosegmentation and a corresponding annulation of the lacunar system, the bursal rays are digitiform and few in number, the vaginal funnel is long and the genital openings are subterminal in both sexes: the type species is *A. segmentatum* from *Hyporhamphus sayori*. W. L. Bullock

Nematoda

189—ALLGÉN, C. A., 1957. [Stallmäst gt. 21c, Malmö V, Sweden.] "On a small collection of free-living marine nematodes from Greenland and some other Arctic regions, with reviews and analyses of the compositions of all hitherto known Arctic nematode faunas." *Meddelelser om Grönland*, 159 (3), 42 pp.

A collection of marine nematodes from Greenland and a variety of Arctic regions included 29 species of 25 genera, of which two genera and eleven species are new. The new taxa are described and figured but no diagnosis is given for any of them. [Almost all figures are at wide variance with the descriptions.] *Ritenbenkia* n.g., said to belong probably to the

Leptosomatidae, is characterized by a large sclerotized stoma with longitudinal striations, surrounded by plates, and armed with an enchelidid type of tooth. *R. macropapillata* n.g., n.sp., the type species, is 29 mm. long. In *Aponcholaimus* n.g. the head is set off and strongly chitinized, the stoma is small and bears two small opposite teeth, and the tail is said to contain four glands. *A. linhomoeoides* n.g., n.sp. is the type species. The other new species described are: *Leptosomatium microlaimum* n.sp. (sclerotized cylindrical stoma), *Thoracostoma multipapillosum* n.sp. (about 15 small pre-anal supplements), *T. macrochaetum* n.sp. (four pairs of cephalic setae, the most posterior longer), *Oncholaimus curvicauda* n.sp., *Oncholaimellus arcticus* n.sp., *Pelagonema papillatum* n.sp. [stated in a footnote as probably to be referred to a new subgenus or genus called *Arctopelagonema*], *Cyatholaimus unalaskensis* n.sp., *Chromadora crassicauda* n.sp., and *Microlaimus labradorensis* n.sp. An adult *Mermis* sp. is also described. With the aid of 16 tables Allgén reviews the marine free-living nematode fauna of Arctic localities; *Mermis* sp. and *Contracaecum* sp. are included. R. W. Timm

190—ALLGÉN, C. A., 1958. [Stallmäst gt. 21c, Malmö V, Sweden.] "Über einige freilebende marine Nematoden von der Ostküste Südamerikas (Uruguay, Nordküste Argentinas)." *Zoologischer Anzeiger*, 160 (9/10), 206–217.

18 species of marine nematodes are reported from the coasts of Uruguay and northern Argentina; three genera and seven species are new and are described and figured [the author states that six species are new]. *Ungulilaimus* n.g. of the Cyatholaimidae is characterized by a cylindrical stoma with thick walls, four times as long as broad, and two claw-like teeth at the anterior. *U. filicaudatus* n.g., n.sp. is the type species. *Ungulilaimella* n.g. has a short cylindrical stoma with ribs at the anterior and a conical tooth at its base. The amphids are single spiral and the oesophagus has a large end-bulb. *U. bulbosa* n.sp. is the type species. *Longilaimus* n.g. is characterized by a double stoma with anterior cylindrical and posterior funnel-shaped walls. The amphids are circular and thick walled. *L. longicaudatus* n.sp. is the type species. Other new species include: *Anticoma longissima* n.sp., *Phanoderma paracampbelli* n.sp. (similar to *P. campbelli* but much smaller and with a smaller tail), *Oncholaimus notoviridis* n.sp. (similar to *O. viridis* but with a larger stoma and shorter tail), and *Neochromadora notocraspedota* n.sp. (similar to *N. craspedota* but with thicker annulations and a different pattern of the lateral alae). R. W. Timm

191—ALTHERR, E., 1960. "*Rhabditis guenini* n.sp." *Bulletin de la Société Vaudoise des Sciences Naturelles*, 67 (5), 211–214.

Altherr describes and figures *Rhabditis guenini* n.sp. found in a garden at Lausanne. It resembles *R. hartmanni* Sachs, 1950 most closely but differs in having a more slender body, a shorter tail, shorter spicules (28μ to 30μ), a spatulate gubernaculum, a wider buccal cavity and a characteristic cuticle marked by transverse striations interspaced by transverse rows of small dots. W. G. Inglis

192—BIOCCA, E., 1957. [Istituto di Parassitologia, Università di Roma.] "*Angiostrongylus chabaudi* n.sp., parassita del cuore e dei vasi polmonari del gatto selvatico (*Felis silvestris*)."

Atti della Accademia Nazionale dei Lincei. Rendiconti. Classe di Scienze Fisiche, Matematiche e Naturali. Rome. Serie 8, 22 (4), 526–532. Biocca describes and figures *Angiostrongylus chabaudi* n.sp. from the heart and pulmonary circulation of *Felis silvestris* in central Italy. The new species most closely resembles *A. vasorum* (Baillet, 1866) and *A. raillieti* (Travassos, 1927) but differs from the first in the greater length of the spicules, 0.510–0.555 mm. against 0.360–0.400 mm., and the form of the caudal bursa and from the second in the larger, non-clavate oesophagus, the structure of the spicules and the form of the bursa. W. G. Inglis

193—BRZESKI, M., 1960. "*Cephalobus* (*Heterocephalobus*) *kaczanowskii* subgen.nov., sp.nov. (Nematoda: Cephalobidae)." *Bulletin de l'Académie Polonaise des Sciences. Classe II. Série des Sciences Biologiques*, 8 (4), 163–165. [Russian summary p. xviii.]

Brzeski describes and illustrates *Cephalobus kaczanowskii* n.sp. from peat moss (*Sphagnum*) in Kampinos Forest, near Warsaw, and in a dry pine wood, in true mosses, at Mikolajki, district Mrągowo, and refers it to a new subgenus *Heterocephalobus* as type species. Two

further species, *C. (H.) heterospiculum* Allgén, 1951 and *C. (H.) strandi-cornutus* Allgén, 1934 are also referred to the new subgenus. *C. kaczanowskii* differs from the first in the shape of the lips (well developed, smooth) and coarser striations on the cuticle and from the second in the shape of the lips and tail (with terminal spike), and in having only a single ovary. The subgenus *Heterocephalobus* is characterized by a slender body, a pointed elongate tail and by the males being frequent, while the subgenus *Cephalobus* is characterized by a compact, fusiform body, an obtuse, short tail and by males being rare. The latter subgenus contains seven species. A key is given for both males and females of the new subgenus. W. G. Inglis

- 194—GUPTA, S. P., 1960. [Institute of Parasitology, McGill University, Macdonald College P.O., Quebec, Canada.] "Nematode parasites of vertebrates of East Pakistan. V. Spirurid nematodes." *Canadian Journal of Zoology*, **38** (3), 575–584.

Gupta redescribes *Dispharynx nasuta* (with *D. pavonis* Sanwal, 1952 as a new synonym), *Torquatella balanoccephala* and *Gastronodius strassenii* from *Sturnus c. contra*, *Merops o. orientalis* and *Crocidura caerula* respectively. All three species are reported from East Pakistan for the first time. *Viguiera dicrurusi* n.sp. is described from *Dicrurus macrocercus albirctus* (stomach) and is characterized by eight pairs of pre-anal and four pairs of post-anal papillae, by having two pairs of papillae on the plates around the mouth and by the tubular form, with funnel-shaped proximal ends, of the ensheathed spicules. A key is given to the species of the genus *Viguiera*. W. G. Inglis

- 195—INGLIS, W. G., 1957. [British Museum (Natural History), Cromwell Road, London, S.W.7, U.K.] "A review of the nematode superfamily Heterakoidea." *Annals and Magazine of Natural History*, Ser. XII, **10** (120), 905–912.

Inglis proposes an outline classification of the nematode superfamily Heterakoidea and argues that the family Ascaridiidae and the subfamily Schneidernematinae should be referred to the Ascaridoidea. The Heterakoidea is divided into two families, five subfamilies and thirteen genera, thus: (i) Heterakidae; (a) Heterakinae: *Heterakis* Dujardin, 1845 (sixteen species definitely recognized; nineteen nominal species synonymized; seven species *inquirendae*); *Odontoterakis* Skryabin & Shikhobalova, 1947 (five species of which *O. farii* (Travassos, 1914), *O. interlabiata* (Ortlepp, 1923) and *O. valvata* (Schneider, 1866)—all formerly referred to *Heterakis*—are new combinations); *Pseudaspidodera* Baylis & Daubney, 1922 (with four species); (b) Meteterakinae n.subf.: *Meteterakis* Karve, 1930, (with seven species of which five are listed as new combinations) [but see Helm. Abs., **27**, No. 52a for abstract of the paper published by Inglis in 1958 where the genus is revised and these combinations are first proposed as new]; *Gireterakis* Lane, 1917 (one species); (c) Spinicaudinae: *Spinicauda* Travassos, 1920 with two subgenera, *Spinicauda* (three species and *S. (?) mathevossianae* Skarbilovich, 1950) and *Moaciria* (Freitas, 1956) (with two species—*Aplectana pharyngeodentata* Belle, 1957 is treated as a synonym of *S. (M.) icosiensis* (Seurat, 1917)); *Africana* Travassos, 1920 (one species); *Strongyluris* Mueller, 1894 (twenty nominal species listed with the observation that many are probably indistinguishable; *S. loveridgei* Spaul, 1923 is a synonym of *S. gigas* Spaul, 1923 and *S. paradoxus* Sandground, 1933 was based on teratological specimens); (ii) Aspidoderidae; (a) Aspidoderinae: *Aspidodera* Railliet & Henry, 1912 (six species); *Ansiruptodera* Skryabin & Shikhobalova, 1947 (one species); *Sexansodera* Skryabin & Shikhobalova, 1947 (two species); (b) Lauroiinae Skryabin & Shikhobalova, 1951: *Laurioa* Proença, 1938 (four species); *Paraspidodera* Travassos, 1914 (one species). Meteterakinae is characterized by lips not off-set from body, no inter-labia, fairly wide caudal alae supported by three or four pairs of stout papillae on the male tail and by a large excretory vesicle. W. G. Inglis

- 196—INGLIS, W. G., 1958. [British Museum (Natural History), Cromwell Road, London, S.W.7, U.K.] "A new species of the nematode genus *Thoracostoma* from the Antarctic." *Annals and Magazine of Natural History*, Ser. XIII, **1** (1), 45–48.

Inglis describes a new species of free-living marine nematode, *Thoracostoma (Pseudocella) tabarini*, from Graham Land, Antarctica; the new species is characterized by an extremely short head capsule with wide lateral incisions and amphids which do not project posteriorly to the head capsule. W. G. Inglis

197—INGLIS, W. G. & DÍAZ-UNGRÍA, C., 1959. [Department of Zoology, British Museum (Natural History), London.] "Nematodes de Venezuela, III. Nematodes parásitos vertebrados venezolanos, I. Una revisión del género *Trypanoxyuris* (Ascaridina: Oxyuridae)." *Memorias de la Sociedad de Ciencias Naturales La Salle*, **19** (54), 176–212. [English summary pp. 205–211.]

Inglis & Díaz-Ungria reconstitute the genus *Trypanoxyuris* Ververs, 1923 with six species: *T. trypanuris* Ververs, 1923 (type species); *T. atelis* (Cameron, 1929) n.comb. for *Enterobius atelis*; *T. duplicidens* (Buckley, 1931) n.comb. for *E. duplicidens*; *T. lagothricis* (Buckley, 1931) n.comb. for *E. lagothricis*; *T. interlabiata* (Sandosham, 1950) n.comb. for *E. interlabiata*; and *T. minutus* (Schneider, 1866) n.comb. for *Oxyuris minuta* pro parte. The value of ratios in the delimitation of the species is considered and it is concluded that in general they have little value and should, in any case, be treated with great care. The species referred to the genus *Trypanoxyuris* are characterized by, and differ from those referred to *Enterobius*, having two circles of four papillae each on the head, a complex mouth opening, a distinct buccal cavity into which the pharyngeal portions project freely, a terminal spike on the male tail and a characteristically T-shaped spicule with a distinct cap on the anterior end. All the species are fully redescribed with full synonymies and host lists. All the species are reported from Venezuela for the first time except *T. lagothricis* and *T. duplicidens*, of which only the type specimens were seen. The structure of the head in all the species has been studied in detail and it is demonstrated that the remarkable mouth opening described by Sandosham (1950) in *T. interlabiata* as consisting of three lips and three interlabia is in fact composed of three highly modified lips: a dorsal with three lobules—two large and one small, a right ventro-lateral with two lobules—one large and one small, and the left ventro-lateral lip-lobe which is reduced to a small triangular structure. This analysis is supported by the form of the mouth in the larval stages and in the male. The structure of the head throughout the genus is analysed functionally and it is argued that the form of the mouth opening is functionally associated with the form of the pharyngeal portions. The three-lipped mouth opening is considered primitive and the two-lipped more advanced. It is suggested that the dorso-ventral symmetry characteristic of the two-lipped mouths has been produced by the loss of one ventro-lateral lip. It is confirmed that *Oxyuronema atelophora* Kreis, 1932 is a synonym of *T. atelis* and is suggested that *Oxyuris microon* Linstow, 1907 may be indistinguishable from *T. interlabiata*.
W. G. Inglis

198—KHAN, M. A., 1960. [Research Station, Research Branch, Canada Department of Agriculture, Lethbridge, Alberta, Canada.] "Descriptions of two nematodes, *Ektaphelenchus macrostylus* n.sp., and *Laimaphelenchus ulmi* n.sp., with a key to species of *Laimaphelenchus*." *Canadian Journal of Zoology*, **38** (1), 91–97.

Females of the new ectoparasite, *Ektaphelenchus macrostylus*, were found under the elytra of *Dendroctonus pseudotsugae* Hopk. (Coleoptera: Scolytidae), and males in beetle galleries of Douglas fir at Vernon, British Columbia. The new species, *Laimaphelenchus ulmi*, from the bark of *Ulmus americana* L. at Ottawa is described and each sex distinguished, in a key, from those of *L. moro* and *L. penardi*.
H. E. Welch

199—KHAN, M. A., 1960. [Research Station, Research Branch, Canada Department of Agriculture, Lethbridge, Alberta, Canada.] "*Stictylus hastatus* (Khan, 1957) n.comb., and *Stictylus ungulacaudus* (Khan, 1957) n.comb. (Nematoda: Neotylenchidae)." *Canadian Journal of Zoology*, **38** (1), 225–226.

The tylenchoid characters of *Stictylus hastatus* (Khan, 1957) n.comb. and *S. ungulacaudus* (Khan, 1957) n.comb. necessitated making these new combinations as a result of the transfer by Wachek in 1955 of *Sphaerularia* Dufour, 1837 to the Aphelenchoidea, and the synonymizing, by Rühm in 1956, of *Sphaerulariopsis* Wachek, 1955 with *Stictylus* Thorne, 1941. H. E. Welch

200—KRUIDENIER, F. J. & MEHRA, K. N., 1959. [University of Illinois, Urbana, Illinois, U.S.A.] "*Wellcomia perognathi* n.sp. (Nematoda: Oxyuridae) from pocket mice, *Perognathus intermedius* (Merriam, 1889) of the Grand Canyon, Arizona." *Transactions of the Illinois State Academy of Science*, Year 1958, **51** (3/4), 20–25.

Kruidenier & Mehra describe a new species of nematode, *Wellcomia perognathi* from *Perognathus intermedius* from Grand Canyon, Arizona, U.S.A. The species is characterized by sexual

dimorphism of the head, the presence of a gubernaculum, distinct caudal alae and a characteristic arrangement of the caudal papillae in the male and by a non-eversible vagina in the female. The mouth, in the female, is surrounded by two sets of three structures, the inner set being dorsal and ventro-lateral in position—considered by the authors to be “intermediate lip structures”—and the outer set being ventral and dorso-lateral in position—considered to be lips. In the male the “intermediate lip structures” are large and the lips are very reduced.

W. G. Inglis

- 201—LE VAN HOA, 1959. [Institut de Parasitologie, Faculté de Médecine de Paris, France.] “Un nouveau trichostrongylide de lièvre africain.” *Annales de Parasitologie Humaine et Comparée*, **34** (5/6), 625–630.

Hoa describes a new species of nematode, *Paralibyostrongylus mordanti* n.sp. from the stomach of *Lepus zechi* at Parakou, Dahomey (French West Africa). The species differs from *Libyostrongylus bathyergi* Ortlepp, 1939 by having a large gubernaculum 135μ long by 40μ wide, from *P. vondeviei* Ortlepp, 1939 by the externo-dorsal ray being nearer the dorsal at its origin, from *P. nigeriae* (Baylis, 1928) in the relationship of the externo-dorsal rays, from *P. hebreunicus* (Lane, 1923) in the shape of the spicules and from *L. alberti* (Van den Berghe, 1936) by the form of the ending of the dorsal ray. The female is 10 mm. long and the vulva opens 2 mm. from the posterior end. The pars ejectrix is large and the female tail is simple and pointed. The spicules are 250μ long and complicated with a transparent membrane over the rounded ends.

W. G. Inglis

- 202—MACHADO DE MENDONÇA, J., 1960. “Nota prévia sobre a segunda espécie do gênero *Caenostromylylus* Lent & Freitas, 1938 (Nematoda, Strongyloidea).” *Atas da Sociedade de Biologia do Rio de Janeiro*, **4** (2), 24–26.

Machado de Mendonça describes a second species of the nematode genus *Caenostromylylus* Lent & Freitas, 1938 from the stomach of *Myrmecophaga tridactyla* from the Estado de Mato Grosso, Brazil. The new species, *C. magnificus*, differs from *C. splendidus* Lent & Freitas, 1938 in the form of the spicules, which are short (0.164 mm. to 0.181 mm. long), well cuticularized and divided into two points relatively close to the base, and in the form of the gubernaculum, the telamon and the dorsal bursal ray. There are no figures.

W. G. Inglis

- 203—MASSEY, C. L., 1960. [Rocky Mountain Forest and Range Experiment Station, Forest Service, USDA, Colorado State University, Fort Collins, Colorado, U.S.A.] “A new species of Nematoda, *Cylindrocorpus erectus*, associated with *Scolytus multistriatus* Marsh. in American elm.” *Proceedings of the Helminthological Society of Washington*, **27** (1), 42–44.

A new species, *Cylindrocorpus erectus*, is described from the egg and larval galleries of *Scolytus multistriatus* Marsh. (Coleoptera: Scolytidae) in American elm at Albuquerque, New Mexico and Fort Collins, Colorado. It is separated from *C. cruzii* Goodey, 1935 by the stouter body, shorter female tail, and stouter male tail with nine papillae in the inflated cuticular portion.

H. E. Welch

- 204—MOROZOV, Y. F., 1960. [Gelmintologicheskaya laboratoriya, Akademiya nauk SSSR, Moscow, U.S.S.R.] [Changes in the classification of the family Physalopteridae Leiper, 1908 in relation to the study of *Pseudophysaloptera soricina* Baylis, 1934.] *Zoologicheskii Zhurnal*, **39** (3), 327–329. [In Russian: English summary p. 329.]

Pseudophysaloptera soricina is redescribed from specimens found in three *Sorex araneus* and one *Neomys fodiens*. In addition to the usual sessile papillae on the male tail, three pairs of pedunculate papillae were found at the base of the caudal alae. *Pseudophysaloptera*, which as well as this type species also contains *P. formosana* and *P. rinkinana*, is made synonymous with *Physaloptera*, as the presence or absence of pedunculate papillae is the chief differential character between these two genera. It is assumed that the other two species will similarly show the presence of pedunculate papillae on more careful examination. These three species and *Physaloptera kotlani* are further placed in a subgenus which the author calls *Pseudophysaloptera* (Baylis, 1934) n.subg., while *Pseudophysalopterinae* becomes a synonym of *Physalopterinae*.

G. I. Pozniak

- 205—SARWAR, M. M., 1959. [College of Animal Husbandry, Lahore, West Pakistan.] "Reconstruction of the genus *Trichuris*, and a short review of its taxonomy and morphology." **Biologia. Lahore**, 5 (1), 19–35.

Sarwar reviews the history, classification and salient advancements in knowledge of the morphology of the genus *Trichuris* (Rudolphi). He proposes the creation of three new genera, viz., *Rudolphia* (with *T. vulpis* Froelich, 1789 as type), *Buckleyuris* (with *T. ovis* Abildgaard, 1795 as type) and *Salamia* (with *T. skrjabini* Baskakov, 1924 as type). *T. serrata*, *T. concolor*, *T. campanula* and *T. georgius* are transferred to *Rudolphia*, *T. globulosa*, *T. cervicaprae*, *T. barbertonensis*, *T. antidorchi*, *T. parvispicularis*, *T. vondrwei*, *T. citelli* and *T. capreoli* to *Buckleyuris*, and *T. leporis*, *T. spiricollis*, *T. baeri*, *T. unguiculatus*, *T. sylvilagi* and *T. discolor* to *Salamia*. A new subfamily, Buckleyurinae, is erected to include *Buckleyuris* and *Salamia*. Diagnostic characters of all the new taxa are given and the paper is illustrated with six line drawings. S. Willmott

- 206—SPASSKI, A. A. & SONIN, M. D., 1958. [Laboratory of Helminthology, Academy of Sciences of USSR, Moscow, U.S.S.R.] "*Ornithofilaria tuvensis* sp.n., a new filaria from the subcutaneous tissue of gallinaceous birds." **Acta Veterinaria. Budapest**, 8 (4), 305–315.

Ornithofilaria tuvensis n.sp. is described from the subcutaneous connective tissue of the legs of galliform birds in the Autonomous Tuva Territory, U.S.S.R. The male is 14 mm. to 17 mm. long with an oesophagus 0.49 mm. to 0.60 mm. long; the testis is single; the spicules, which are slightly sub-equal, are somewhat funnel-shaped with bluntly rounded posterior ends; there are four pairs of post-anal papillae and three pairs of pre-anal; there is a nipple-like structure on the anterior cloacal lip. The female is 37 mm. to 55 mm. long with the oesophagus 0.79 mm. to 1.05 mm. long; the vulva is 0.25 mm. to 0.31 mm. from the anterior end. No differential diagnosis is given. The species is very common, occurring in 18 out of 19 *Perdix daurica*, 10 out of 13 *Lyrurus tetrax*, two out of four *Tetrao urogallus* and one out of ten *Lagopus mutus*. No specimens were found in 10 *Tetrastes bonasia* or in four *Tetrao gallus*. 1,130 birds were examined from the Tuva Territory and *O. tuvensis* was found only in the Galliformes. The subfamily Aproctinae is partially reviewed and the genus *Ularofilaria* Lyubimov, 1946 is treated as a synonym of *Ornithofilaria* Gönner, 1937. It is pointed out that probably all species of the Aproctinae bear cephalic papillae and caudal papillae on the male tails. *Ornithofilaria rotundicephala* Oshmarin, 1950 is considered a species *incertae sedis* and *Ularofilaria papilloserca* Lyubimov, 1946 is referred to *Ornithofilaria* as a new combination. W. G. Inglis

- 207—THOMAS, P. M., 1959. [Zoology Department, University of Adelaide, Australia.] "Some nematode parasites from Australian hosts." **Transactions of the Royal Society of South Australia**, 82, 151–162.

Thomas describes four new species and amplifies the descriptions of six others. *Capillaria miniopterae* n.sp. from the stomach of *Miniopterus blepotis* at Canungra, Queensland, is characterized by pre-anal alae, the absence of spicules, a non-spinous sheath and the absence of bacillary bands. *Nicollina cameroni* n.sp. from *Echidna aculeata* at Kangaroo Island, is characterized by two lateral alae, the absence of marked longitudinal crests, the coiled habit of the body, and long slender spicules without alae, 400 μ to 550 μ in length, the right ending in a ball and the left in a simple point. The mouth is surrounded by six lips. *Molinostrongylus dollfusi* n.sp. from *Miniopterus blepotis*, Canungra, Queensland and Naracoorte, South Australia, is very close to *M. panousi* Dollfus, 1954 but differs in the length of the spicules, 150 μ to 160 μ , and their shape, by the presence of a well developed dorsal lobe to the bursa and by a larger cephalic inflation. *Hedruris longispicula* n.sp. from *Lygosoma challengerii* at Springbank, South Queensland, is characterized by spicules almost as long as the tail and by the position of the vulva—750 μ from the posterior end. *Amplificaecum mackerrasae* nom.nov. is proposed for *Ophidascaris varani* Johnston & Mawson, 1947 in which the type has been restudied and found to have an intestinal diverticulum. *O. varani* is therefore referable to *Amplificaecum* where the specific name is preoccupied and must be changed. Further specimens are recorded and described from *Varamus varius*, Mt. Nebo, Queensland. Extended redescriptions are given for *Amidostomum biziurae*, *Nicollina echidnae*, *Nycteridostomylus unicollis*,

Austrostrongylus thylogale, *Pharyngodon australis* and *Abbreviata bancrofti*. *Porrocaecum* (*Laymanicaecum*) sp. and *Ophidascaris* sp. are reported from *Emusium balloti* and *Amphibolurus barbatus* respectively. W. G. Inglis

208—TRAVASSOS, L., 1960. "Sobre nematódeos cavitários de peixes do Rio Amazonas." *Atas da Sociedade de Biologia do Rio de Janeiro*, 4 (2), 15–20.

Travassos redescribes *Philometra senticosa* Baylis, 1927 from *Arapaima gigas* and refers it to the genus *Philometroides* Yamaguti, 1935 as a new combination. *Philometra amazonica* n.sp. is described from *Calophysus macropterus* and is characterized by the absence of cuticular spines and by the form of the tail which is bluntly rounded. Males were not found. *Rumai rumai* n.g., n.sp. is described from *A. gigas* and is referred to the family Philometridae. The genus is characterized by the truncated cap-like appearance of the anterior end of the body. Only one female was found and it was 40 mm. long. A classification of the superfamily Philometroidea Travassos, 1933 is proposed, without diagnoses: Philometridae with *Philometra*, *Philometroides*, *Clavinema*, *Ichthyofilaria*, *Philoneura*, *Rumai*; Micropleuridae n.fam. with Micropleurinae Baylis & Daubney, 1922; Dracunculidae with Dracunculinae Stiles & Hassall, 1907 and Avioserpensinae Wehr & Chitwood, 1934. Philometroidea is used instead of the name Dracunculoidea proposed by Cameron (1934) because it has priority. [Under the Rules of Zoological Nomenclature the name Dracunculoidea still has priority as the genus *Dracunculus* was first used as the type of a family group by Stiles & Hassall in 1907 as Travassos has noted in this publication.] W. G. Inglis

209—TRAVASSOS, L. & KLOSS, G. R., 1957. [Instituto Oswaldo Cruz, Rio de Janeiro, D.F., Brazil.] "*Cephalobium socialis* (Leidy, 1850) comb.n." [Abstract of paper presented at Academia Brasileira de Ciências.] *Anais da Academia Brasileira de Ciências*, 29 (4), Suppl. p. LI.

Travassos & Kloss refer *Oxyuris socialis* Leidy, 1850, a nematode parasite of *Gryllus assimilis* (Orthoptera), to the genus *Cephalobium* and consider *C. microbivorum* Cobb, 1920 and *C. nitidum* Artigas, 1925 to be indistinguishable from it. W. G. Inglis

210—WEHR, E. E. & HWANG, J. C., 1959. "Erratum." *Journal of Parasitology*, 45 (2), 197.

The authors draw attention to the fact that in their paper in *J. Parasit.*, 1957, 43, 649–655, Anhingofilariinae is to be replaced by Wymaniinae nom.nov. [For abstract see *Helm. Abs.*, 26, No. 398dn.] S. Willmott

Nematomorpha

No relevant abstracts in this issue

Hirudinea

211—MOORE, J. P., 1957. [University of Pennsylvania, Philadelphia 4, Pennsylvania, U.S.A.] "Hirudinea." *Report Series. B.A.N.Z. Antarctic Research Expedition*, 6B (6), 101–105.

Moore records *Austrobdella translucens*, *Pontobdella rayneri* and *P. rugosa* (both from near Hobart, Tasmania), and describes *P. biannulata* n.sp. and *Trachelobdellina glabra* n.g., n.sp. *P. biannulata* is a small (20 mm.) pontobdellid, three-annulate and non-tuberculate on the trachelosome, two-annulate on the strongly tuberculated urosome, with a six-annulate tuberculated clitellum and gonopores separated by three annuli. *T. glabra* has an attenuated slender trachelosome which is equal in length to the strongly expanded urosome, large prominent pulsatile vesicles on XIII to XXIV inclusive, 12-annulate somites on the trachelosome, six- to eight-annulate on the urosome, the skin is smooth and non-tuberculate, the gonopores are separated by three annuli, and it is colourless. L. R. Richardson

- 212—RICHARDSON, L. R., 1959. [Victoria University of Wellington, P.O. Box 196, Wellington, New Zealand.] "New Zealand Hirudinea. IV. *Makarabdella manteri* n.g., n.sp., a new marine piscicolid leech." **Transactions of the Royal Society of New Zealand**, 87 (3/4), 283–290.

The definition of *Makarabdella manteri* n.g., n.sp., which is based on a single specimen 11.75 mm. long from a monkfish (*Leptoscopus* sp.), is as follows: body cylindrical, continuous, unornamented; suckers, thin, discoid, entire; gastric caeca, simple, segmental; posterior gastric caecum simple, distally bifid and with three median perforations; testes, five pairs; seminal vesicles present; segments six-annulate; external respiratory vesicles, minute; genital apertures separated by five annuli; ovaries lateral, in line with testes. There are seven figures.

L. R. Richardson

Pentastomida

No relevant abstracts in this issue

Miscellaneous

- 213—STUNKARD, H. W., 1957. [American Museum of Natural History, New York, U.S.A.] "Intra-specific variation in parasitic flatworms." **Systematic Zoology**, Washington, D.C., 6 (1), 7–18. There are at present no adequate means of determining the degree of intraspecific variation in the Platyhelminthes and the precise limits of specificity will remain unknown until the factors affecting development and morphology are understood. Because these worms are hermaphrodite and self-fertilizing no genetic species can be defined. Not until complete life-histories have been elucidated and the whole range of intermediate and definitive hosts is known, together with the effect of the host on the parasite, can morphological species be defined with assurance. Although host varieties may be recognized subspecies have no meaning in cestodes and trematodes. The paper is illustrated by numerous examples. S. Willmott

INVERTEBRATE INTERMEDIATE HOSTS

Arthropoda

- 214—FRANK, F., 1960. [Zavod za zootehniku i zoohigijenu, Veterinarski fakultet, Univerzitet u Sarajevu, Yugoslavia.] "Utjecaj svjetla na brojnost oribatida na pašnjacima." **Veterinaria**, Sarajevo, 9 (2), 291–294. [English summary p. 291.]

Frank carried out some experiments on the phototaxis of oribatid mites. 200 mites were placed in petri dishes, totally obscured with dark paper. Half of these dishes were placed in a flat glass vessel containing water and the other half in a similar dish without water. It was found that mites migrated into the flat vessel more quickly in the presence of water than they did in its absence. 50 out of 65 mites that had migrated into the flat vessel with water remained alive on the third day, while three that remained in the petri dish had died. In field experiments oribatid mites were collected on two days and at different times of the day. The numbers and species collected were almost the same. It is therefore concluded that these mites do not avoid light and that sheep can be infected with *Moniezia expansa* at any time of day, except when the temperature is much over 20°C. and the grass is too dry. N. Jones

- 215—GUN, D. C., 1960. [Otdel parazitologii, Vtoroi voenno-meditsinski institut (Shanghai).] [A new intermediary of human filariasis in China.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni**, Moscow, 29 (1), 98–101. [In Russian: English summary pp. 100–101.]

Gun reports that *Aedes togoi*, which commonly occurs in the coastal villages of south-east China, was found to be a natural intermediate host of *Wuchereria malayi* and *W. bancrofti*. 4.4% of 613 mosquito specimens examined in an endemic area of human filariasis contained microfilariae at various stages of development. Half of the infected mosquitoes contained

microfilariae of *W. bancrofti* and the other half those of *W. malayi*. 43.75% of the infected mosquitoes had microfilariae at the infective stage. Following experimental infection of *A. togoi*, 23.8% of 21 insects were infected with *W. bancrofti* and 81.3% of 16 mosquitoes with *W. malayi*. 19.1% of the experimental insects had infective bancroftian microfilariae and 56.3% infected *W. malayi* larvae. The difference in the results of experimental infections is explained by the fact that there were more *W. malayi* microfilariae in the blood (25 and 88 per 20 ml.) than there were *W. bancrofti* (7 microfilariae per 20 ml.). N. Jones

- 216—ROTH, L. M. & WILLIS, E. R., 1957. [Pioneering Research Division, Quartermaster Research Engineering Center, Natick, Massachusetts, U.S.A.] "The medical and veterinary importance of cockroaches." *Smithsonian Miscellaneous Collections*, 134 (10), 147 pp.

This monograph contains a short chapter on cockroaches as vectors of pathogenic helminths and a long appendix giving details of the association of cockroaches with helminthic disease arranged under taxonomic order of parasites. The helminths are grouped into those the eggs of which have been carried by cockroaches; those for which cockroaches serve as intermediate hosts; those the transmission of which by cockroaches has been doubtfully recorded; and those for which cockroaches have been shown experimentally not to be intermediate hosts. There is a useful bibliography. No reference is made to the helminth parasites of cockroaches themselves. J. M. Watson

Mollusca

- 217—GRÉTILLAT, S., 1958. [Laboratoire central de l'Élevage, Service de parasitologie, Tananarive, Madagascar.] "Contribution à la connaissance des hôtes intermédiaires et à l'étude du cycle évolutif de *Paramphistomum cervi* (Schränk, 1790), (Trematoda, Paramphistomidae), à Madagascar." *Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux*, 11 (4), 427–438. [English & Spanish summaries p. 438.]

Grétilat exposed laboratory-bred *Anisus crassilabrum*, *Biomphalaria madagascariensis*, *Lymnaea hovarum*, *Bulinus mariei* and *B. liratus* to miracidia of *Paramphistomum cervi* in Madagascar. Only *B. mariei*, which is very wide-spread throughout the country, and *B. liratus* became infected. When the snails were maintained at 20° to 30°C. cercariae were shed after 35 days (*B. mariei*) and after 50 days (*B. liratus*). A calf was infected experimentally with cercariae from *B. mariei* and immature forms were recovered from the rumen and reticulum 76 days later. There is more than one generation of rediae, the daughter rediae giving rise to cercariae. The paper is illustrated by a number of photomicrographs. S. Willmott

- 218—GRIFFITHS, H. J., 1959. [Division of Pathology and Parasitology, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota, U.S.A.] "*Stagnicola (Hinckleyia) caperata* (Say), a natural intermediate host for *Fascioloides magna* (Bassi, 1875), in Minnesota." *Journal of Parasitology*, 45 (2), 146.

A specimen of *Stagnicola (Hinckleyia) caperata*, which had overwintered on a pasture in Pine County, Minnesota, shed cercariae of *Fascioloides magna*. It appears likely that infection had occurred the previous autumn. If this is so the observation is of economic importance in that it means *F. magna* infection can be acquired early in the grazing season in Minnesota. S. Willmott

- 219—HOSAKA, Y. ET AL., 1959. [Yamanashi Prefectural Medical Research Institute, Kofu, Japan.] [The growth of *Oncomelania nosophora* in the natural habitat.] *Japanese Journal of Parasitology*, 8 (5), 745–748. [In Japanese: English summary p. 748.]

The increase in shell length of *Oncomelania nosophora* in their natural habitats (Yamanashi Prefecture) was measured. For 90 days from July to October, the rate of growth per week was 0.27 mm. to 0.34 mm. in shell length, although there was a local difference among the snail groups of each habitat. Y. Yamao

- 220—IJIMA, T., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Ecological studies on the variation of population density of *Oncomelania nosophora*, the intermediate host of *Schistosoma japonicum* in natural habitat.] **Japanese Journal of Parasitology**, 8 (4), 586–600. [In Japanese: English summary p. 600.]

A survey of the population dynamics of *Oncomelania nosophora*, the vector snail of *Schistosoma japonicum*, was made in different habitats. Copulation of snails was recognized from March to September, with the highest occurrence in May and September. Copulation did not take place in July, owing to the extraordinary desiccation of their habitats. The seasonal appearance of offspring was confirmed to be twice a year, which differed according to the conditions. In autumn young snails were found abundantly. To become adult took about five to six months in autumn and winter, and about three months in spring. From winter to spring the death rate was considered to be about 10% to 20%. Because of the unusually dry summer, in which this observation was made, the death rate rose to about 85%. Y. Yamao

- 221—ITO, J., MOCHIKZUKI, H. & NOGUCHI, M., 1959. [Hygiene Laboratory, Faculty of Education, Shizuoka University, Shizuoka, Japan.] [Studies on the cercariae parasitic in *Semisulcospira libertina* in Shizuoka Prefecture.] **Japanese Journal of Parasitology**, 8 (6), 913–922. [In Japanese: English summary pp. 921–922.]

About 34,000 specimens of the fresh-water snail *Semisulcospira libertina* from various areas in Shizuoka Prefecture were investigated to study the cercarial fauna. Cercariae obtained were as follows: *Paragonimus westermani*, *Pseudexorchis major*, *Centrocestus armatus*, *Metagonimus* spp., *Notocotylus magniovatus* and *Pseudobilharziella corvi*; *Cercaria nipponensis*, *C. incerta*, *C. monostyloides*, *C. yoshidae*, *C. innominatum*, *C. pseudodivariata*, *C. introverta*, *C. manei* and *C. longicercus*; and echinostomes. Y. Yamao

- 222—KASSAI, T., 1958. [Institute of General Zoology and Parasitology of the Veterinary College, Budapest, Hungary.] "Larvae of protostrongylins in snails." **Acta Veterinaria**, Budapest, 8 (3), 223–236. [Russian summary.]

Kassai carried out experiments on the inter-relationship between protostrongyle larvae and the snail hosts. *Helix pomatia*, *Helicella obvia*, *Cepaea vindobonensis*, *Zebrina deirita* and *Theba carthusiana* were exposed to infection with *Cystocaulus* larvae. He concluded that: (i) the larvae actively penetrated the snails via the sole of the foot through the furrow; (ii) they became localized in the cavities of the muscle and connective tissue network, between the glandular cells, mantle and, occasionally, in the tentacles; (iii) there was marked difference in the distribution of larvae along different parts of the sole of the foot; (iv) no defence reaction was produced in the connective tissue of infected snails; (v) development in the snails was influenced by the following factors, arranged in order of importance, environmental temperature, species of snail, individual host reaction, and vitality of the larvae. The paper is illustrated with seven figures. N. Jones

- 223—KOMIYA, Y., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [The natural habitat of *Oncomelania nosophora*, the vector snail of *Schistosoma japonicum*, and the present situation of the cemented ditches.] **Japanese Journal of Parasitology**, 8 (6), 923–931. [In Japanese: English summary pp. 928, 931.]

The main habitats of *Oncomelania nosophora* in Japan are known to be the moist edges of irrigation ditches between rice paddies. In addition to these, however, they are found on the edges of creeks, in moist and grassy river beds and in uncultivated swamps, the last-named being considered to be the original habitat of these snails. For the eradication of *Oncomelania* cementing ditches is insufficient because other natural habitats would still exist. These should, therefore, be changed ecologically to prevent snails from living in them. Y. Yamao

- 224—MIKAČIĆ, D., 1960. "Prilog istraživanju epizootologije fascioloze (ličinke trematoda u našim slatkovodnim puževima)." **Veterinarski Arhiv**, 30 (3/4), 71–76. [English and French summaries pp. 75–76.]

Mikačić examined 8,369 *Galba truncatula*, 2,035 *Radix peregrina* and 268 *Stagnicola palustris*. Only *G. truncatula* was found to harbour larval stages of *Fasciola hepatica*, incidence of infection ranging from 0% in March to 4.79% in September, and falling again towards the end of the

year. This snail was also found to harbour xiphidiocercariae (1.12%), echinocercariae (0.54%) and furcocercariae (0.09%). Xiphidiocercariae were found in 3.7% and echinocercariae in 4.41% of *R. pereger* and, respectively, in 2.27% and 1.86% of *S.p. alustris*. It is suggested that the xiphidiocercariae, echinocercariae and furcocercariae from different snail species belonged to the same, or closely related, trematode species. N. Jones

- 225—MORI, K., OKAMOTO, K., NAKAGOME, T. & SUGIURA, K., 1959. [Department of Medical Zoology, Showa Medical School, Tokyo, Japan.] [Observations on the habitat of *Oncomelania nosophora* with filter paper.] **Japanese Journal of Parasitology**, 8 (4), 542–546. [In Japanese: English summary p. 546.]

During the summer months of 1958, habits of *Oncomelania nosophora* were observed, by a filter paper method, in area near Kofu City, Yamanashi Prefecture, where schistosomiasis was endemic. The population density of snails was higher in rice fields, especially around the entrance of the water from ditches, than in other places tested. No snails were found in swamps. Mori *et al.* concluded from these observations that snails were distributed by irrigation, as stated by previous investigators. Y. Yamao

- 226—SUDDS, Jr., R. H., 1960. [University of North Carolina.] “Host-parasite relations of the larval stages of the digenetic trematodes in normal and abnormal snail intermediate hosts.” **Dissertation Abstracts**, 20 (9), 3700.

Control

- 227—FUNNIKOVA, S. V., 1959. [Otdel gelmintologii, Kazanski NIVI, U.S.S.R.] [Testing of organic phosphorus compounds for the control of molluscs.] **Trudi Kazanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, No. 13, pp. 387–397. [In Russian.]

Funnikova used 1,000 *Lymnaea stagnalis*, *Galba palustris* and *Radix lagotis* to test the molluscicidal effect of tetraethylmonothiophosphate (Pyrophos) and tetraethyldithiophosphate (Dithiophos). She found that: (i) 5 ml. of 0.2% aqueous emulsion of Pyrophos kills all snails within 42 hours under laboratory conditions, while the same quantity of 0.1% emulsion kills all snails within 118 hours; (ii) Dithiophos, under the same conditions and respective concentrations, kills all snails within 95 and 167 hours; (iii) 90% to 100% of submerged snails were killed by an aqueous emulsion of Pyrophos within 63 hours at a concentration of 1 : 50,000 and within 35 to 72 hours at 1 : 500,000; (iv) when 5 ml. of this emulsion, at a concentration of 0.2% was sprayed at the rate of 3.0 to 3.5 litres per hectare, 85% to 100% of the snails in boxes on the ground died within 65 to 72 hours; (v) at a concentration of 1 : 1,000 aqueous emulsion of Pyrophos killed 81% of the snails within 185 hours under natural conditions; (vi) *Lymnaea stagnalis* and *Galba palustris* were found to be less resistant than *Radix lagotis*.

N. Jones

- 228—LUNGU, V., GEORGESCU, L., FROMUNDA, V. & STOICAN, E., 1959. “Cercetări privind asanarea pășunilor contaminate de fascioloză. Comunicarea a II-a.” **Lucrarile Stiintifice ale Institutului de Patologie si Igiena Animala**. Bucharest, Year 1958, 9, 315–323. [French and Russian summaries pp. 322–323.]

Prophylactic measures against *Fasciola hepatica* were carried out using copper sulphate against the molluscan host over an area of 45 hectares on six pastures in different geo-climatic zones. 91% to 100% of the snails were destroyed with a 10% concentration of the product applied in the form of aerosols or with a concentration of four to eight per thousand in the dispersed form in the case of small vegetation. Where vegetation was higher than 20 cm., 75% efficacy was attained. The authors recommend: (i) the use of motor pumps of the system P.S.N.–6 or M.S.P.–8 and a concentration of 10% of copper sulphate in the case of flat surfaces; (ii) portable pumps using concentrations of seven to eight per thousand in the case of uneven surfaces; (iii) bags with copper sulphate spaced according to the speed and volume of water for small streams; (iv) the direct jet of portable pumps in cases of small puddles; (v) open drains to increase the efficacy of chemical treatment in the case of pastures disposed in superimposed terraces; and (vi) where vegetation is higher than 30 cm., it should be cut before chemical

treatment of the pasture. Previous observations have been confirmed, namely, that the distribution of molluscs in Rumania is limited to biotopes representing 3% to 16% (average 10%) of the total pasture surface. Very slight infections were found in sheep from treated pastures as compared with those from untreated pastures. N. Jones

229—SASA, M., MIURA, A. & OGAWA, M., 1959. [Department of Parasitology, Institute for Infectious Diseases, University of Tokyo, Tokyo, Japan.] [Comparative studies on the toxicity of metaldehyde, various arsenates and arsenites on *Oncomelania nosophora*, the intermediate host of *Schistosoma japonicum*.] **Japanese Journal of Parasitology**, 8 (5), 708–713. [In Japanese: English summary p. 713.]

Sasa *et al.* investigated the toxicity of various organic and inorganic chemicals to *Oncomelania nosophora* in the laboratory. Arsenites were usually several times as toxic as arsenates of the same metal, but in both the toxicity was related to the metal. Sodium, calcium and copper salts were relatively effective, trivalent metals such as iron and aluminium produced less toxic salts. Among the other chemicals tested, metaldehyde was one of the most effective substances against *O. nosophora* and was less toxic to mice than the other chemicals. It also seemed to be attractive to the snail. Y. Yamao

Miscellaneous

No relevant abstracts in this issue

GENERAL HELMINTHOLOGY

Technique

230—BRYGOO, E. R., CAPRON, A. & RANDRIAMALALA, J. C., 1959. [Institut Pasteur de Madagascar.] “Sur quelques méthodes de coloration sélective des coques d’œufs d’helminthes parasites de l’homme.” **Bulletin de la Société de Pathologie Exotique**, 52 (5), 655–664.

The eggs of various helminths were examined in histological preparations stained by a number of well known techniques. A table shows the staining affinities of the eggs of *Schistosoma haematobium*, *S. mansoni*, *Ascaris lumbricoides*, *Enterobius vermicularis*, *Trichuris trichiura*, *Ancylostoma duodenale*, *Clonorchis sinensis*, *Opisthorchis felinus*, *Taenia saginata* and *Dipylidium caninum*, when treated with Ziehl’s carbolfuchsin, crystal violet, methyl green and haemalum-eosin stains. The results are discussed in detail. It is concluded that an acid-alcohol resistant substance occurs in the egg-shells of helminths relatively frequently. No conclusion based on these techniques can yet be reached concerning the chemical nature of the shell. The authors suggest a combination of Ziehl-Nielson and methyl green staining for identification of helminth eggs in tissues and they describe their method for combining the two. J. E. D. Keeling

231—DOUGHERTY, E. C., 1959. [Laboratory of Comparative Biology, Kaiser Foundation Research Institute, Richmond, California, U.S.A.] “Introduction to axenic culture of invertebrate Metazoa: a goal.” **Annals of the New York Academy of Sciences**, 77 (2), 27–54.

Dougherty contributes the general introduction to a series of papers on the axenic culture of invertebrate metazoa. Tables in the text include the terminology of conditions for the growth of organisms, information concerning the species which have been successfully grown under axenic conditions, a list of major groups not yet cultured successfully and some possible candidates for such attempts. An appendix of nomenclature for culture media is given. J. E. D. Keeling

232—EARL, P. R., 1959. [Wistar Institute, University of Pennsylvania, Philadelphia, U.S.A.] “Filariae from the dog *in vitro*.” **Annals of the New York Academy of Sciences**, 77 (2), 163–175.

Microfilariae of *Dirofilaria immitis* were maintained in Mixture 199 plus inactivated dog serum at 37°C. The longest survival time (61 days) was recorded when the serum content was 30%. Layering the medium over a sheet of dog kidney cells or substitution of heterologous cow and

horse serum for the dog serum did not alter the survival time significantly. With the dog serum content at the 10% level the larvae survived 18 days at room temperature. After shell freezing at -70°C . for 30 minutes about 40% of the larvae were recovered in a viable condition. No viable larvae were recovered after two months' storage. Observations on adult filariae in Mixture 199 and a modified Eagles' HeLa medium, each containing 10% inactivated horse serum, showed that females produced acidification of the medium with about three times the rapidity of the males. This rate was maintained after the females had ceased extruding young. A female observed *in vitro* was ovoviviparous, the four-cell stage eggs developing to the microfilaria stage in the medium. It is suggested that oxidative metabolism is essential for survival as all activity ceased after three days under anaerobic conditions. Filariae were maintained for 65 days at 37°C . in the Eagles' HeLa medium-serum mixture but died within five days at 4°C . The postural behaviour of the filaria is described and it is noted that both sexes contain a brown pigment and show sensitivity to visible and ultra-violet light. J. E. D. Keeling

- 233**—EVANS, A. S., 1960. [Naval Medical Research Institute, National Naval Medical Center, Bethesda, Maryland, U.S.A.] "Immunophysical methods in parasitic infections: a continuous electrophoresis apparatus for preparative fractionation of protein systems." *Experimental Parasitology*, New York, **9** (2), 105–112.

Evans describes a continuous electrophoresis apparatus for the fractionation of mixtures of proteins. The apparatus has several features not found in most other designs and is especially suitable for the preparations of relatively large samples. W. P. Rogers

- *234**—FANG, T. C. ET AL., 1959. ['Copper gauze hatching method' for laboratory diagnosis of schistosomiasis japonica.] *Acta Laboratorium Clinicarum*, **3** (1), 36. [In Chinese.]

- 235**—HANSEN, E. L., YARWOOD, E. A., NICHOLAS, W. L. & SAYRE, F. W., 1960. [Laboratory of Comparative Biology, Kaiser Foundation Research Institute, Richmond, California, U.S.A.] "Differential nutritional requirements for reproduction of two strains of *Caenorhabditis elegans* in axenic culture." *Nematologica*, **5** (1), 27–31. [German summary p. 31.]

Two strains of *Caenorhabditis elegans* designated as the *Bergerac* strain and the *Bristol* strain were maintained in axenic culture [growth of a single species in the absence of living organisms or living cells of any other species] for more than three years. The axenic cultures were maintained largely in media derived from liver and occasionally chick embryo extract. In addition, chemically defined media containing amino-acids, vitamins, glucose, salts and nucleotides were used. Neither strain reached maturity in the chemically defined media alone. Distinct differences in population growth between the two strains were observed in several of the media and it is suggested that these differences are related to the ability of the two strains to utilize certain bound vitamins or co-factors from organic media. H. R. Wallace

- 236**—HEYNEMAN, D., 1959. [Department of Zoology, University of California, Los Angeles, U.S.A.] "Cuticular peeling: a dissection technique for preparation of cestode whole mounts." *Journal of Parasitology*, **45** (6), 573–574.

After suitable staining and dehydration, the dorsal and ventral longitudinal muscle layers can be stripped off thick cestode proglottides, rendering them suitable for anatomical studies and demonstration. The operation is performed with the specimens in terpeneol under a dissecting microscope, using only a needle or scalpel and a pair of jewellers' forceps. The prepared specimens are then mounted in heated natural Canada balsam. With care, the technique can also be applied to trematodes. J. E. D. Keeling

- 237**—HIGASHI, T., FUKUTOME, Y. & MORIHANA, M., 1958. [College of Agriculture, University of Osaka Prefecture, Sakai, Osaka, Japan.] [Studies on parasite tests with surface active agents. I. Collection of eggs of *Fasciola hepatica*.] *Journal of the Japan Veterinary Medical Association*, **11** (11), 535–538. [In Japanese.]

Watanabe's method for the collection of eggs of *Fasciola hepatica* from cattle faeces was modified by substituting the water with an 0.5% solution of a surface active agent. 1.6 to 1.9 times more eggs were collected by this modified method than by the original one. Twelve different

types of the substances were tested and all were equally effective. These substances had no effect on the fluke eggs and could be recommended for group faecal examination. Y. Yamao

- 238—IJIMA, T., SASAKI, T. & HOSAKA, Y., 1958. [Yamanashi Prefectural Medical Research Institute, Kofu, Japan.] [The evaluation of several techniques for examining *Fasciola hepatica* ova in faeces in comparison with the results of skin test.] **Japanese Journal of Parasitology**, 7 (1), 48–50. [In Japanese: English summary p. 50.]

Faecal examinations for fascioliasis were carried out on 29 sheep and each technique was evaluated for its efficacy. An intracutaneous reaction for liver-fluke gave 100% positive results, but autopsy results revealed that only 14 out of the 29 sheep were infected, indicating that this reaction was not reliable. The rate of positive findings with various techniques of faecal examination were as follows: flotation with sodium silicic acid 8·33%, smear 44·29%, A.M.S.III 52·85%, N.I.H. 75·71%, Watanabe's 88·57%, and modified Watanabe's 95·23%.

Y. Yamao

- 239—KOMIYA, Y., KOJIMA, K. & KOYAMA, T., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [A simple technique for rearing *Oncomelania* in petri dish.] **Japanese Journal of Parasitology**, 8 (5), 721–724. [In Japanese: English summary p. 724.]

Soil was placed in a petri dish 9 cm. in diameter, most of which was covered with water. Eight to ten snails, *Oncomelania* spp. the vector of *Schistosoma japonicum* were reared in it. They were fed once or twice a week on diatoms cultured with modified Knop's solution and fine rice powder.

Y. Yamao

- 240—LEBIED, B., 1960. [Laboratoire du Service d'Hygiène, Bukavu, Belgian Congo.] "Mise au point à propos d'une nouvelle méthode de dissection des vecteurs des filarioses. Le but de cette méthode." **Rivista di Parassitologia**, 21 (1), 71–79. [English and Italian summaries pp. 76–78.]

Lebied reiterates his technique of demonstrating microfilariae in the vectors and its purpose, and points out the advantages of this technique as compared with its modification by Nelson [for abstracts see Helm. Abs., 19, No. 889, 26, No. 337b; 27, No. 213d]. The author also takes the opportunity to rectify the error passes in the literature, as to the author of this technique and its place or origin.

N. Jones

- 241—LEVINE, N. D., MEHRA, K. N., CLARK, D. T. & AVES, I. J., 1959. [College of Veterinary Medicine, University of Illinois, Urbana, U.S.A.] "A comparison of nematode egg counting techniques for cattle and sheep feces." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 44.

- 242—LEVINE, N. D., MEHRA, K. N., CLARK, D. T. & AVES, I. J., 1960. [College of Veterinary Medicine, University of Illinois, Urbana, Ill., U.S.A.] "A comparison of nematode egg counting techniques for cattle and sheep feces." **American Journal of Veterinary Research**, 21 (32), 511–515.

Levine *et al.* counted worm eggs in sheep and cattle faeces using the McMaster dilution and the Stoll direct centrifugal flotation techniques and a direct count method. Details of the methods and their modifications are given. It was concluded that there was no significant difference between the results obtained by the McMaster and direct count methods but that the centrifugal flotation method gave significantly lower counts. The relative merits of different media for flotation are discussed. The authors state that the McMaster technique is rapid and efficient for both sheep and cattle faeces. They advocate that a standard method should be used by all workers so that difficulties in interpreting egg counts can be reduced.

H. D. Crofton

- 243—MIKAMI, Y., 1959. [Prof. Ishihara's Department of Internal Medicine, Tottori University School of Medicine, Yonago, Japan.] [Tracer test isotope labelled larvae of *Ancylostoma caninum*.] **Journal of the Yonago Medical Association**, 10 (4), 837–849. [In Japanese.]

A search was made for the most adequate isotope for the labelling of *Ancylostoma caninum*. To trace the migration in the host P³², I¹³¹, Na²², Ca⁴⁵, Cr⁵¹ and Fe⁵⁹ were tested, and Fe⁵⁹ was found to be most abundantly absorbed by the larvae. The excretion of the isotope by the larvae labelled with Fe⁵⁹ was also found to be the least. Mikami states that this isotope is most convenient and forms an excellent tracer for the larvae.

Y. Yamao

- 244—MIURA, U. ET AL., 1958. [Department of Hygiene, Faculty of Medicine, Kyoto University, Kyoto, Japan.] [Studies on sanitary treatment of night-soil by heating process utilizing surplus midnight electric power.] **Japanese Journal of the Nation's Health**, 27 (3), 153-161. [In Japanese: English summary pp. 153-154.]

The nightsoil in a treatment tank was heated to 60°C. at night by the flow of electric current between electrodes placed on the ends of the tank. The consumption of electric power for the treatment of 1 cubic metre of nightsoil was 51 kwh on the average throughout the year. The treatment completely exterminated *Ascaris* eggs. In examinations made 7 to 12 months after the start of the operation, no embryonated *Ascaris* eggs were found in the soil fertilized with the treated nightsoil, while there were 6% to 38% of embryonated *Ascaris* eggs in the soil fertilized with untreated nightsoil. Miura *et al.* concluded that the treatment was satisfactory.

Y. Yamao

- 245—MUELLER, J. F., 1959. [State University of New York, Upstate Medical Center, Syracuse 10, New York, U.S.A.] "The laboratory propagation of *Spirometra mansonoides* (Mueller, 1935) as an experimental tool. III. *In vitro* cultivation of the plerocercoid larva in a cell-free medium." **Journal of Parasitology**, 45 (6), 561-573.

Starting with proceroid larvae from laboratory maintained and infected copepods, Mueller has cultured infective plerocercoid larvae of *Spirometra mansonoides* in a medium containing six parts Mixture 199 with 10% calf serum and 1.5 parts chick embryo extract. The larvae grew rapidly in the early stages of culture and reached up to 10 mm. in length in a month. The larvae were infective to cats and reached full sexual maturity. Details of culture management technique should be read in the original.

J. E. D. Keeling

- 246—OHISHI, I., KOBAYASHI, S. & KUME, S., 1959. [School of Veterinary Medicine, Tokyo University of Agriculture and Technology, Fuchu, Tokyo, Japan.] [Diagnosis of canine filariasis. III. Method for concentrating microfilariae in blood.] **Journal of the Japan Veterinary Medical Association**, 12 (4), 149-153. [In Japanese: English summary p. 153.]

Ohishi *et al.* explain their method of concentrating canine microfilariae in test blood using the following solution: 5 c.c. 0.5% methylene blue solution, 5 c.c. acetone, 0.2 gm. sodium citrate and 90 c.c. water. They state that their method will detect any small number of microfilariae so long as they exist in a dog, and that it is superior to any other method previously used.

Y. Yamao

- 247—OHKUNI, T., 1959. [Department of Internal Medicine, School of Medicine, Tokyo University, Tokyo, Japan.] [Studies on the method of judging clinical effect of anthelmintic action against *Ascaris*.] **Journal of the Japanese Society of Internal Medicine**, 48 (9), 1439-1456. [In Japanese.]

A new method for evaluating anthelmintic effect against *Ascaris lumbricoides* was tested, which consisted of a two-stage treatment. First, the treatment was carried out using the anthelmintic to be tested. Three weeks later, a second treatment was carried out using santonin. As a control a standard treatment was also carried out using santonin. The results were evaluated statistically and the effectiveness of various anthelmintics was calculated.

Y. Yamao

- 248—ROHDE, K., 1960. [Parasitologische Abteilung der Asta-Werke AG., Chemische Fabrik Brackwede/Westphalia, West Germany.] "Quantitative Infektion von weissen Ratten mit Eiern des Katzenbandwurmes (*Taenia taeniaeformis*) und deren Entwicklung zur Finne (*Cysticercus fasciolaris*)." **Zeitschrift für Tropenmedizin und Parasitologie**, 11 (1), 43-50. [English summary p. 50.]

Albino rats have been successfully infected with the feline tapeworm (*Taenia taeniaeformis*) by the administration, by mouth, of infective eggs obtained by removing the last proglottides from tapeworms dissected out of a freshly killed cat. The eggs are released from the proglottis into 0.9% saline. This technique allows the infection of a large number of rats for chemotherapeutic investigations. Large batches of rats must be used to prove the effectiveness of a substance as even without treatment death and calcification of many bladderworms (*Cysticercus*

fasciolaris) occur. If the action of the substances on fully grown bladderworms is to be tested, biopsies must be carried out before treatment in order to select rats with fully grown bladderworms. Errors due to fully grown cysticerci having "spontaneously" died can be avoided by using rats infected some three to seven months before testing.

K. R. Heath

249—ROMAN, E. & GOUTTEBARGE, L., 1959. "Un procédé de conservation des oeufs de *Bilharzia haematobia* (Trématodes digénétiques)." *Cahiers des Naturalistes*, **15** (4), 117–118.

Eggs of *Schistosoma haematobium* were preserved in urine over a period of 19 months by the addition of 2 ml. of 1% mercuric cyanide per 15 ml. urine. Two samples were preserved in this way, all the eggs in one and most of the eggs in the other remained intact.

J. E. D. Keeling

250—ROWAN, W. B. & GRAM, A. L., 1959. [Communicable Diseases Center, Bureau of State Services, Public Health Service, U.S. Department of Health, Education and Welfare, San Juan, Puerto Rico.] "Quantitative recovery of helminth eggs from relatively large samples of faeces and sewage." *Journal of Parasitology*, **45** (6), 615–621.

Sediment from a large volume of sewage is strained, blended and dispensed from a reservoir on to a separating tray through a number of fine glass jets. The flow of sewage must be slow and of regular speed to ensure good results. As the sewage flows over 1.0% saline in channels running longitudinally along the separating tray, helminth eggs and heavier particles settle and collect in the saline. This is collected and the eggs are re-sedimented over 2.0% saline. Aliquots of the final suspension are vacuum filtered in a Büchner funnel. The filter paper can be treated with ninhydrin reagent to stain *Schistosoma mansoni* eggs, but *Ascaris* and *Trichuris* eggs show up well without staining. The filter paper is sandwiched with a few ml. of 2% agar-agar between two glass plates for examination under a low power dissecting microscope. Experimental results show that the efficiency in recovering eggs from sewage is 70%, 40% and 60% for *Ascaris*, *Trichuris* and *Schistosoma* respectively. The technique can also be used to recover eggs from animal tissues or to estimate the total number of eggs passed by a subject under treatment or experimentation.

J. E. D. Keeling

251—STOLL, N. R., 1959. [The Rockefeller Institute, New York, U.S.A.] "Conditions favoring the axenic culture of *Neoplectana glaseri*, a nematode parasite of certain insect grubs." *Annals of the New York Academy of Sciences*, **77** (2), 126–136.

Stoll briefly describes the biology and notes the axenic culture of *Neoplectana glaseri* Steiner, 1929 for 14 years (about 219 generations) on kidney tissue on slants of dextrose-agar. His own studies on the axenic culture of the nematode in fluid media showed that it may be cultured in a heat-stable infusion broth of 10% R.L.E. (raw liver extract) at a pH of 6.0 to 6.5 R.L.E. from the livers of rabbits in late pregnancy gave a three to fourfold promotion of growth. Culture on a shaking machine in the dark at a temperature of 22°C. also promoted growth, while yield per unit ingredients is increased in Erlenmeyer flasks of a specific size.

H. E. Welch

***252**—SU, H. S. ET AL., 1959. [Carmine flocculation reaction and its value in diagnosis of schistosomiasis japonica.] *Acta Laboratorium Clinicarum*, **3** (3), 9–11. [In Chinese.]

253—SUGAWARA, K., 1959. [Department of Hygiene, Faculty of Medicine, Kyoto University, Kyoto, Japan.] [Studies on the differentiation of vital and dead *Ascaris* ova by staining. I. Preparation of the smear of *Ascaris* eggs by removal of the protein membranes.] *Japanese Journal of the Nation's Health*, **28** (1), 11–15. [In Japanese: English summary p. 11.]

The protein membranes of an *Ascaris* egg were completely dissolved in a short time by the following solution: 10 gm. of chlorinated lime was added to 100 c.c. of physiological saline, followed by 100 c.c. of 10% aqueous solution of sodium carbonate and 0.5 gm. of pancreatin. The solution was stirred and filtered. *Ascaris* eggs, of which the protein membranes had been removed by this solution, developed quite normally, no difference in development being noted between the treated and untreated eggs.

Y. Yamao

- 254—SUGAWARA, K., 1959. [Department of Hygiene, Faculty of Medicine, Kyoto University, Kyoto, Japan.] [Studies on the differentiation of vital and dead *Ascaris* ova by staining. II. Fundamental experiments of staining methods and the differentiation of the fate of *Ascaris* eggs in faeces by staining.] **Japanese Journal of the Nation's Health**, 28 (1), 16–22. [In Japanese: English summary p. 16.] The following staining methods, according to Sugawara, distinguished living and dead eggs of *Ascaris lumbricoides*, protein membranes of the eggs having been removed by his own method which was previously reported: Felman's procedure for Sudan black B stain for lipoid, Lollain Smith's Nile blue sulphate method for neutral fats, Lillie's method for desoxyribonucleic acid, Brachet's pyronin-methyl green staining desoxyribose and ribose nucleic acid, Dean's method for ascorbic acid, Chèvremont and Frédéricq's demonstration of sulph-hydrils, and Millon's method for total protein. Among them, the best and most effective were Smith's Nile blue sulphate method for neutral fats and the demonstration of sulph-hydrils by Chèvremont and Frédéricq. Y. Yamao
- 255—TAKAHASHI, T., OKAMOTO, K. & SONOE, M., 1959. [Department of Biology, Showa Medical School, Tokyo, Japan.] [Studies on plerocercoid of *Diphyllbothrium mansonii* in vitro.] **Japanese Journal of Parasitology**, 8 (5), 677–686. [In Japanese: English summary p. 686.] Plerocercoid larvae of *Diphyllbothrium mansonii* in 0.9% sodium chloride solution survived longer than those in any other kind of saline solution tested. The temperature range from 10°C. to 20°C. was suitable for their survival *in vitro*. At a temperature of 10°C., the larvae cultured in the medium containing canine serum lived as long as 65 days. The plerocercoids raised *in vitro* for 37, 40, 50, 60 and 65 days respectively were given to dogs *per os*. These worms were capable of developing normally and reaching the adult form as usual. Histochemical examinations revealed that the quantity of glycogen in the parenchyma of the worms gradually decreased, the decrease being proportional to the duration of cultivation. Glycogen content of muscles, however, did not decrease. Y. Yamao
- 256—TANAKA, S., 1957. [Department of Surgery, Faculty of Medicine, Hirosaki University, Hirosaki, Japan.] [Studies of the efficacy of sodium dehydrocholate in excluding foreign matter from the biliary tract. 1st report: A study on the efficacy of dehychol as a bile secretion promoter.] **Hirosaki Medical Journal**, 8 (4), 694–702. [In Japanese: English summary p. *115.] The effectiveness of various drugs on bile secretion was examined, using a "T"-shaped tube attached to the bile-duct after cholecystostomy. Dehychol was proved to be excellent for bile-duct irrigation, producing diluted bile in a large quantity. Y. Yamao
- 257—TANAKA, S., 1957. [Department of Surgery, Faculty of Medicine, Hirosaki University, Hirosaki, Japan.] [Studies on the efficacy of sodium dehydrocholate in excluding foreign matter from the biliary tract. 2nd report: Experimental studies on excluding *Ascaris* eggs.] **Hirosaki Medical Journal**, 8 (4), 703–708. [In Japanese: English summary pp. *116–*117.] *Ascaris* eggs injected into the bile-duct of a dog were excreted very quickly when dehychol was simultaneously given intravenously. From this result, the use of dehychol is recommended for the expulsion of *Ascaris* eggs, especially after cholecystostomy. Y. Yamao
- 258—TSUDA, M., 1959. [Department of Parasitology, School of Medicine, Chiba University, Chiba, Japan.] [Biological studies on *Paragonimus westermani*. 1. A new technique for collection of the metacercariae of *Paragonimus westermani* from the second intermediate host and on the distribution of the metacercariae in *Eriocheir japonicus* by this technique.] **Japanese Journal of Parasitology**, 8 (5), 805–811. [In Japanese: English summary p. 811.] Tsuda has devised a new procedure for collecting metacercariae of lung flukes using a meat-grinder. The incidence of metacercariae in *Eriocheir japonicus*, examined by this method, was found to be greater in the cephalothorax and abdomen than in the foot, and greater in the foot than in the gills. Y. Yamao
- 259—WARNER, L. J. & HAGUE, N. G., 1960. [Imperial College Field Station, Sunninghill, Ascot, Berks, U.K.] "An improved method of making perspex cavity blocks for the processing of nematodes." **Nematologica**, 5 (1), 71–72. Warner & Hague describe a brass mould for making optically suitable hemispherical depressions in perspex blocks, thus eliminating the tedious polishing necessary when the holes are formed by drilling. R. D. Winslow

- 260**—WEINSTEIN, P. P. & JONES, M. F., 1959. [Laboratory of Tropical Diseases, National Institute of Allergy and Infectious Diseases, Public Health Service, Bethesda, Maryland, U.S.A.] "Development *in vitro* of some parasitic nematodes of vertebrates." **Annals of the New York Academy of Sciences**, **77** (2), 137–162.

Weinstein & Jones describe some recent investigations on the growth and maintenance of nematode larvae *in vitro*. A basal medium of serum-chick embryo homogenate was used. In relatively high concentrations of these materials filariform larvae of *Nippostrongylus muris* were capable of reaching the fifth stage. Human serum was compared directly with rat serum and found to be superior. However, considerable variations in the yield of fifth-stage worms occurred with different samples of the same basal medium. Supplements such as a vitamin mixture, Eagles' medium and liver concentrate increased the fifth-stage worm yield. The worms did not mate in culture but infertile eggs were deposited by the females. In chemically defined media alone, or with supplements added, survival but no growth occurred. Under strict axenic conditions, development from egg to mature adult was obtained without the use of antibiotics. Worms which were removed from the intestine of the rat did not mate during *in vitro* culture. Third-stage larvae of *Necator americanus* showed some development when cultured by similar techniques. J. E. D. Keeling

- 261**—ZUCKERMAN, B. M., 1960. [Dept. of Entomology & Plant Pathology, University of Massachusetts, U.S.A.] "A method for the concentration of nematodes for mounting from the Baermann apparatus." **Proceedings of the Helminthological Society of Washington**, **27** (1), 37–39.

Zuckerman describes a technique whereby a representative sample of nematodes drawn from a Baermann funnel is rapidly concentrated into a single drop of water on a slide for microscopical examination. A 10 ml. to 15 ml. sample is drawn from the Baermann funnel into a beaker and the nematodes relaxed by heating in an incubator for five minutes at 60°C. The sample is then transferred to a separating funnel to the base of which is attached a tapered glass tube. The liquid is passed slowly through an inverted 250 mesh sieve. The sieve is then returned to its normal position and the spot where the liquid went through (which can be localized by a half-inch ring of slide sealing compound) is centred over a microscope slide. A drop of fixing solution is passed through the sieve at the same spot and falls on to the slide taking with it a good proportion of the nematodes caught on the sieve. D. J. Hooper

Geographical Distribution

- 262**—ALLGÉN, C. A., 1957. [Stallmäst gt. 21c, Malmö V, Sweden.] "Vergleich zwischen den marinen Nematodenfaunen Norwegens und der Tropen I." **Kongelige Norske Videnskabers Selskabs Forhandlinger**, Year 1956, **29** (9), 36–40.

Allgén compares the free-living marine nematode fauna of Norway with the fauna of tropical Central and South America and of tropical Africa. Four tables are given showing the number of species found in each locality and the percentage of species common to both Norway and the tropics. R. W. Timm

- 263**—ALLGÉN, C. A., 1957. [Stallmäst gt. 21c, Malmö V, Sweden.] "Vergleich zwischen den marinen Nematodenfaunen Norwegens und der Tropen II." **Kongelige Norske Videnskabers Selskabs Forhandlinger**, Year 1956, **29** (10), 41–46.

Allgén continues his comparison of the Norwegian nematode fauna with tropical areas. South- and south-east Asia and Australia are considered and with the aid of four tables it is seen that the fewest species are common between Norway and south-east Asia. Of a total of 409 species from all tropical areas 40 species are known from Norway. R. W. Timm

- 264**—BABERO, B. B., SHEPPERSON, J. R. & SICAY, T. C., 1959. [Department of Biology, Southern University, Baton Rouge, Louisiana, U.S.A.] "Additional records of gnathostomes in North American hosts." **Revista de Biología Tropical. Universidad de Costa Rica**, **7** (1), 63–66. [Spanish summary p. 65.]

Babero *et al.*, after listing the previous records of gnathostomes in North American mammals, report that they have found *Gnathostoma* spp. from 22 raccoons (stomach), 14 opossums (stomach and liver), two skunks (stomach) and one snake (larval stage, parietal peritoneum)

from widely separated localities in the State of Georgia, U.S.A. The authors consider *G. procyonis* Chandler, 1942 is indistinguishable from *G. spinigerum* Owen, 1836 and think it probable that this is the only species of *Gnathostoma* occurring in North American hosts.

W. G. Inglis

- 265—BEARUP, A. J., 1958. [School of Public Health and Tropical Medicine, University Grounds, Sydney, New South Wales, Australia.] "Occurrence of *Ollulanus tricuspis* in Australia." [Correspondence.] **Australian Journal of Science**, 21 (5), 149–150.

Ollulanus tricuspis is recorded for the first time in Australia in an immature stray cat. The peculiarities of the life-cycle are noted and it is suggested that transmission is probably only through vomitus. The adult parasites are very small and on casual observation with a dissecting microscope may be mistaken for larvae of *Aelurostrongylus*.

H. McL. Gordon

- 266—BEKLEMISHEV, V. N., 1959. [Institut meditsinskoi parazitologii i tropicheskoi meditsini im. Martinovskogo, Ministerstvo zdravookhraneniya SSSR, Moscow, U.S.S.R.] [Some principles of the nosogeography of arthropod-borne diseases of man.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 28 (6), 648–657. [In Russian: English summary p. 657.]

Beklemishev discusses the world distribution of transmissible (arthropod-borne) diseases of man in relation to man's activities in nature. He distinguishes those diseases which have changed their world range because man and/or his domesticated animals are the epidemiologically significant source of the infection, and those which exist in natural foci and have remained unchanged. Filarial infection and *Wuchereria* are mentioned amongst the examples, which are taken chiefly from amongst the protozoa.

G. I. Pozniak

- 267—CAVENESS, F. E., 1959. [Dept. of Plant Pathology, South Dakota State College, Brookings, South Dakota, U.S.A.] "Distribution of cyst- and gall-forming nematodes of sugar beets in the United States." **Journal of the American Society of Sugar Beet Technologists**, 10 (6), 544–552.

The distribution of *Heterodera schachtii*, *Meloidogyne incognita* var. *acrita*, *M. hapla*, other unidentified species of *Meloidogyne* and also *Nacobus batatiformis* on sugar-beet in the U.S.A. is shown on maps, and a detailed list of the counties in which these species have been found is given. *H. schachtii* is known from 96 counties in 15 States, *M. incognita* var. *acrita* from 10 counties in California and Colorado, *M. javanica* from one field in California, *M. hapla* from 22 counties in 10 States and *N. batatiformis* from 14 counties in six States.

A. M. Shepherd

- 268—GIRALDO, L. E., FAUST, E. C., BONFANTE, R. & CAKCEDO, G., 1959. [Facultad de Medicina, Universidad del Valle, Cali, Colombia.] "Parasitologic surveys in Cali, Departamento del Valle, Colombia. VI. Diagnostic findings from parasitologic examination of excreta of dogs, human beings and a hog collected on the streets of Ward Siloé, Cali, Colombia." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 46.

- 269—KIMURA, R., MIYATA, Y., KOIDE, K. & MASUDA, S., 1960. [Department of Medical Zoology, Niigata University School of Medicine, Niigata, Japan.] [A new endemic area of lung-fluke disease in Niigata Prefecture.] **Niigata Medical Journal**, 74 (2), 212–215. [In Japanese.] An endemic area of paragonimiasis was found along the River Igarashi, Niigata Prefecture. An intradermal test for the lung flukes was 14.8% positive among those 10 to 14 years of age, and 42.1% positive among those 15 to 19 years of age.

Y. Yamao

- 270—KROTOV, A. I., 1960. [Institut malyarii, meditsinskoi parazitologii z gelmintologii, Moscow, U.S.S.R.] [Zoogeographical analysis and hypotheses on the origin of the helminth fauna of vertebrates on Sakhalin Island.] **Zoologicheskii Zhurnal**, 39 (4), 481–489. [In Russian: English summary p. 489.]

An analysis, on the island of Sakhalin, of the helminth fauna of 4,000 vertebrates in relation to their historical and ecological properties, has shown that of the 303 helminth species found, 105 are distributed over the whole Palaearctic and even Holarctic, 40 are amphiboreal, 16 are endemic species for the island, another 16 are east asiatic (Sakhalin, Far East, even Japan), four are Indo-Malayan and two are northern. These data allow the island to be classified as the Sakhalin transitory area of the boreal-forest subregion of the Palaearctic. The helminth

fauna, which comprised 130 cestode, 125 nematode, 26 trematode and 22 acanthocephalan species, is discussed under the different groups of hosts and in respect of trends peculiar to the island. Its build up, through the tertiary and quaternary periods, to the present is reconstructed.

G. I. Pozniak

- 271—MARITS, N. M., 1959. [Kafedra obschchei biologii i parazitologii, Kishinevski gosudarstvenni meditsinski institut, U.S.S.R.] [The distribution of *Diphyllbothrium* and *Opisthorchis* infections in Moldavian S.S.R.] *Meditsinskaya Parazitologiya i Parazitarnie Bolezni*. Moscow, 28 (5), 590–591. [In Russian.]

The existence of natural foci of opisthorchiasis and diphyllbothriasis was established along the River Prut in Moldavia. On an average 19.53% of cats examined were infected with *Opisthorchis felineus*. These cats had been fed on raw fish from the river. Of 76 *Esox lucius* examined, 5.26% harboured *Diphyllbothrium latum* and this infection is also known among the local population.

G. I. Pozniak

- 272—SINDERMANN, C. J., 1959. [U.S. Bureau of Commercial Fisheries, U.S.A.] "Zoogeography of sea herring parasites." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 34.

Cytology and Genetics

- 273—SHORT, R. B. & MENZEL, M. Y., 1959. [Florida State University, U.S.A.] "Chromosomes of schistosomes." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 15.

- 274—SHORT, R. B. & MENZEL, M. Y., 1960. [Department of Biological Sciences, Florida State University, Tallahassee, Florida, U.S.A.] "Chromosomes of nine species of schistosomes." *Journal of Parasitology*, 46 (3), 273–287.

Short & Menzel describe and picture the chromosomes in nine species of schistosomes belonging to six genera, namely, *Schistosomatium douthitti*, *Schistosoma mansoni*, *S. haematobium*, *S. japonicum*, *Ornithobilharzia canaliculata*, *Trichobilharzia physellae*, *T. stagnicola*, *Austrobilharzia variglandis* and *Gigantobilharzia huronensis*; and present idiograms for all nine species. This work constitutes the first on chromosomes in *Ornithobilharzia*, *Trichobilharzia*, *Austrobilharzia* and *Gigantobilharzia*. The authors discuss the bearing of their findings on the taxonomy and evolution of the forms involved and predict that, while analysis of the mitotic chromosomes is not likely to be helpful in solving problems of schistosome taxonomy and phylogeny, study of the meiotic chromosomes may well aid considerably in this field.

J. M. Watson

Morphology, Anatomy and Histology

- 275—BECKLUND, W. W., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Spicular anomalies in *Haemonchus contortus* that may be associated with exposure to phenothiazine." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 45.

- 276—BRADBURY, S., 1958. [Department of Zoology, University Museum, Oxford, U.K.] "A cytological and histochemical study of the connective-tissue fibres of the leech, *Hirudo medicinalis*." *Quarterly Journal of Microscopical Science*, 99 (2), 131–142.

Connective tissue fibres and ground-substance in *Hirudo medicinalis* resemble those in *Glossiphonia complanata* in general form and chemical composition, being differentiated into "cortex" and "medulla". The "cortex" contains arginine and acid mucopolysaccharide but no tyrosine or lipids, indicating that it is collagenous, as is confirmed by the X-ray diffraction pattern. The "medulla" is an extension of the fibrocyte. The cytoplasm of the fibrocyte contains mitochondria, spherical lipochondria about 1μ in diameter, larger triglyceride droplets, and diffuse phospholipid and granular accumulations of acid mucopolysaccharide. There seems to be a higher proportion of the last in the ground substance for *Hirudo* than in that for *Glossiphonia*.

L. R. Richardson

- 277—BRADBURY, S. & MEEK, G. A., 1958. [Cytological Laboratory, Department of Zoology, University Museum, Oxford, U.K.] "A study of fibrogenesis in the leech, *Hirudo medicinalis*." **Quarterly Journal of Microscopical Science**, 99 (2), 143-148.

Fibrocytes can be shown to contain triglyceride and phospholipid droplets, and mitochondria, all being recognizable in electron micrographs. A "vesicular" component has been observed just below the cell surface. The collagenous "cortex" of the fibre is tubular, contains a long process of the cell which secretes it, and consists of many small longitudinal fibrils about 250 Å diameter lengthwise to the fibre and arranged in pairs of groups of three or four. Fibrils seem to "shred off" from the surface of the fibrocyte.

L. R. Richardson

- 278—BROWNE, H. G. & CHOWDHURY, A. B., 1959. [Departments of Pathology and Public Health and Preventive Medicine, New York Hospital, Cornell Medical Center, New York, U.S.A.] "The ultrastructure of the intestinal wall of *Ancylostoma caninum*." **Journal of Parasitology**, 45 (3), 241-247.

Browne & Chowdhury have studied, by means of both light and electron microscopy, the structure of the intestinal wall of *Ancylostoma caninum*. Their most significant observation was on the organization of the internal lining of the intestinal cells; this they have shown to have a structural arrangement which may be construed as cilia. The fine structure of the cilia is described and illustrated by photomicrographs. The possible phylogenetic significance of ciliation in nematodes is discussed.

S. Willmott

- 279—CABALLERO DELOYA, J., 1960. [Universidad Nacional Autónoma de México, Facultad de Ciencias, Departamento de Biología, Mexico, D.F.] "Estudio monográfico de algunos nemátodos parásitos de vertebrados de México." **Thesis, Universidad Nacional Autónoma de México**, 109 pp.

Caballero Deloya gives redescriptions of 12 species of nematodes: *Ancylostoma caninum*, *Evaginuris evaginata*, *Paraspidodera uncinata*, *Falcaustra intermedia*, *F. ranae*, *Contracaecum* (*Contracaecum*) *spiculigerum*, *C. (Ornithocaecum) hoffmanni*, *Physaloptera turgida*, *P. obtusissima*, *Abbreviata ranae*, *Hastospiculum onchocercum*, and *H. setiferum*.

W. G. Inglis

- 280—CHIZHOVA, T. P. & GOFMAN-KADOSHNIKOV, P. B., 1959. [Kafedra obshchei biologii, I Moskovski ordena Lenina meditsinski institut imeni Sechenova, Moscow, U.S.S.R.] [Anatomical and histological structure of plerocercoids of diphylobothriids from Lake Baykal.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 28 (6), 728-733. [In Russian: English summary p. 733.]

Two types of diphylobothriid plerocercoids, recovered from cysts on the oesophagus and stomach of salmonid fish in Lake Baykal are described. Plerocercoids from large cysts were an average of 2 cm. to 4 cm. in length (minimum 0.3 cm., maximum 14 cm.), their body wall had deep transverse folds and was covered by cuticular hairs (8 μ to 12 μ long) and the scolex was H-shaped in cross section. Those from small cysts measured not more than 1 cm. and lacked transverse folds, their scolex was round in cross section and both the body and the scolex were covered by cuticular hairs (18 μ to 24 μ long on the body). The area lacking calcareous bodies was 30 μ to 45 μ wide in the first type and 10 μ to 14 μ in the second, and the longitudinal musculature was composed of one to two layers and four to six layers respectively. The structure of the first plerocercoid agrees with that of *Diphylobothrium dendriticum* larvae and of the second with that of *D. vogeli* larvae; their identification is to be confirmed by experimental infection of the final host.

G. I. Pozniak

- 281—DENNEWALD-PESCATORE, M., 1959. [Lab. Biologie, Lycée de Garçons, Luxembourg.] "A propos de la formule ocellaire des populations luxembourgeoises de *Erpobdella octoculata*, Linné." **Archives. Institut Grand-Ducal de Luxembourg. Section des Sciences Naturelles, Physiques et Mathématiques**, 26, 195-197.

71.28% of *Erpobdella octoculata* have eight eyes arranged as four on the second segment and two lateral pairs on the last annulus of segment four. 28.72% have variations in the arrangement of eyes. One group (12.06%) have supplementary eyes. Some leeches have one or two pairs of fused eyes, or additional eyes on segments three and/or four. Another group (12.76%) have five to seven eyes, 75% of these lacking one or more eyes of the anterior row. A third group (3.9%) have eight eyes with one or more eyes situated on annuli between the main rows.

L. R. Richardson

- 282—HASS, D. K. & TODD, A. C., 1959. [University of Wisconsin, Madison, Wisconsin, U.S.A.] "Another anomaly of the reproductive organs in *Ascaris lumbricoides*." **Journal of Parasitology**, **45** (3), 300.

A specimen of *Ascaris lumbricoides* var. *suum* in which there were three complete, mature and functional ovaries, oviducts and uteri is described and illustrated.

S. Willmott

- 283—KASSAI, T., 1958. [Institute of General Zoology and Parasitology, Veterinary College, Budapest, Hungary.] "Studies on the morphology of the adult *Cystocaulus ocreatus* and its preinfective larvae." **Acta Veterinaria. Budapest**, **8** (4), 349–373. [Russian summary.]

The adults and pre-infective larval stages of *Cystocaulus ocreatus* are described and the literature referring to them reviewed. Particular attention is paid to the shape of the tail of the first-stage larva which is characterized by two constrictions, a conspicuous dorsal tail spike and the fact that the tail appendage "is bent in the same plane between the two constrictions and deflected ventrally beyond the distal one". The first-stage larva of *Neostongylus linearis* is characterized by a tail appendage which is straight and squat with a rudimentary dorsal tail spike. It is concluded that the species described by Gerichter [for abstract see Helm. Abs., **20**, No. 513b] is not *C. ocreatus* but probably *N. linearis*. Joyeux & Gaud's view [for abstract see Helm. Abs., **15**, No. 169a] that *Cystocaulus* larvae moult in the lungs of the definitive host and are passed out as second-stage larvae is not accepted. The attempts of Gerichter [for abstract see Helm. Abs., **17**, No. 7d] and Rose [for abstract see Helm. Abs., **26**, No. 22a] to distinguish a pre-infective and an infective larval stage are considered to be inadequate and it is suggested that all protostrongyline larvae should, after their second ecdysis in the gastropod foot, be treated as third-stage infective larvae.

W. G. Inglis

- 284—LAL, M. B., 1959. [Department of Zoology, The University, Lucknow, India.] "Occurrence of a pigment layer in *Gastrothylax crumenifer* (Creplin, 1847)." **Experientia. Basle**, **15** (5), 176–178. [French summary p. 178.]

There is a pigmented layer lining the ventral pouch of *Gastrothylax crumenifer*. Lal has studied this pigment by chemical tests and spectroscopy and has shown that it is not carotenoid in nature but of a haemin type. Detailed results are given.

S. Willmott

- 285—LEUSSINK, J. A., 1958. [Zoologisch Laboratorium, Utrecht, Netherlands.] "Studies on the fauna of Curaçao and other Caribbean islands: Vol. 8, No. 33. Nematodes of the genus *Ozolaimus* in West Indian iguanas." **Natuurwetenschappelijke Studiekring voor Suriname en de Nederlandse Antillen**, No. 17, pp. 127–145.

Leussink gives short redescrptions of *Ozolaimus megatyphlon* (Rudolphi, 1819) and *O. cirratus* (Linstow, 1906), both from *Iguana iguana iguana*, and considers the statistical differences between the measurements of the two species in great detail. It is concluded that in Curaçao and Surinam, distinct differences exist between *O. megatyphlon* populations in different hosts. Differences exist between *O. cirratus* populations in different hosts in Surinam, but these are less distinct in Curaçao. It was not possible to discern geographical differences in either species from Curaçao and Surinam.

W. G. Inglis

- 286—LOGACHEV, E. D., 1960. [Kemerovski gosudarstvenni meditsinski institut, U.S.S.R.] [The structure and development of supporting structures in internal tissues of trematodes.] **Dokladi Akademii Nauk SSSR**, **133** (5), 1262–1263. [In Russian.]

Logachev, while studying the micro-morphology of the parenchyma in *Fasciola hepatica*, observed in it the presence of multinucleate cytoplasmic bodies forming a continuous zone under the dermal musculature. Protoplasmic extensions towards this muscular layer and towards the central parenchyma were observed. The formation, degeneration and structure of these symplasts are described and illustrated with photomicrographs.

N. Jones

- 287—MAGGENTI, A. R. & ALLEN, M. W., 1960. [Dept. of Plant Pathology, University of California, U.S.A.] "The origin of the gelatinous matrix in *Meloidogyne*." **Proceedings of the Helminthological Society of Washington**, **27** (1), 4–10.

Maggenti & Allen describe six large rectal glands which they have observed in living and fixed stained specimens of four species of *Meloidogyne*. The glands are present but hard to see in second-stage larvae. In mature females they surround the peri-anal region and open by ducts

into the rectum. The gland nuclei are 25μ to 32μ across. In mature females before egg production the glands occupy about one fourth of the total body length and are pyriform, the widest part occupying about one fourth of the body width. The gelatinous matrix was observed to exude from the anus as a thread. In mature females the intestine becomes a syncytium without a lumen and loses its connection with the rectum.

M. T. Franklin

- 288—MARKOV, G. S., 1957. [Kafedra zoologii, Stalingradski pedagogicheski institut, Stalingrad, U.S.S.R.] [Systematics of some Oxyurata and Spirurata—parasites of lizards.] **Trudi Leningradskogo Obshchestva Estestvoispytatelei. Otdelenie Zoologii**, 73 (4), 86–94. [In Russian: English summary pp. 93–94.]

Markov has studied in detail parasite material from lizards in Central Asia and Kazakhstan and lists the following characters as important in the specific diagnosis of *Pharyngodon*, *Thelandros* and *Abbreviata*: (i) for *Pharyngodon*—the absolute length of the spicule, the position of the second pair of post-cloacal papillae, the relative length of the male and female tails, the relative length of the tail process to the base of the tail, and the tail armature; while of differential value are the size of the egg, length of the oesophagus and position of the vulva; (ii) for *Thelandros*—the spicule length, the shape of the posterior and of the caudal alae in the male, the shape of the base of the female tail, the position of the uterine loops, the relative length of the oesophagus and the tail, the tail process and the position of the vulva; (iii) for *Abbreviata*—the number of uterine loops and the character of their branching, the number and position of papillae on the ventral side of the male tail, the length of the spicules, the relative length of the oesophagus, the position of the vulva, the size of the egg and the position of the neck papillae and excretory pore. Keys to species are given separately under males and females for the three genera.

G. I. Pozniak

- 289—METTRICK, D. F., 1960. [University College of Rhodesia and Nyasaland, Salisbury, Southern Rhodesia.] "Contributions to the helminth fauna of Central Africa. I. A re-description of *Raillietina* (*Raillietina*) *werner*i (Klaptocz, 1908) from the red-faced cody (*Urocolius indicus*) in Southern Rhodesia." **Proceedings and Transactions of the Rhodesia Scientific Association**, 47, 47–50.

A brief redescription of *Raillietina* (*R.*) *werner*i (Klaptocz, 1908) is given. Considerable variation in the number and size of the rostellar hooks, the number of testes, and the size of the cirrus sac was noted.

D. F. Mettrick

- 290—PAETZOLD, D., 1958. [Physiologisches Institut der Martin-Luther-Universität, Halle (Salle), East Germany.] "Beobachtungen bei der Zucht von *Rhabditis* (*Rhabditella*) *axei* (Cobbold, 1884) Dougherty, 1955 (Nematoda)." **Zoologischer Anzeiger**, 161 (11/12), 299–304.

Paetzold cultured *Rhabditella axei* on potato paste and on Dotterweich's potato agar (DA). A table is given to show that variations in measurements of adults grown on the two media, the mean length of those raised on DA being considerably smaller. The variations in the values of the demanian formula in short-tailed females cultured on potato paste are also presented. The offspring of such females were about one-half short-tailed (females) or with a deformed tail (males). Figures of normal, shortened and deformed tails are given.

R. W. Timm

- 291—PAWŁOWSKI, L. K. & HOFFMANN, J., 1959. [Chaire de Zoologie Générale, Univ. de Lodz, Poland.] "Note comparative sur la configuration des cocons des Piscicolidées, *Cystobanchus fasciatus* (Kollar) et *Cystobanchus respirans* (Troschel)." **Archives. Institut Grand-Ducal de Luxembourg. Section des Sciences Naturelles, Physiques et Mathématiques**, 26, 187–193.

Cystobanchus fasciatus lays an elongate low-ridged naked cocoon more or less pointed at one end, closed with an irregularly rounded plug, and attached by a subelliptic base somewhat wider than the cocoon and irregularly edged. (The plug is half the width of the cocoon). These cocoons are 1.75 mm. by 0.5 mm. *C. respirans* has a cocoon resembling that of *Piscicola geometra* in being nearly as wide (1.2 mm.) as long (1.5 mm.), subcircular, and with a wide attachment disc with sharp irregularities. The surface of the cocoon is finely hairy. With the hair removed, the surface is reticular.

L. R. Richardson

- 292—RAO, K. H., 1959. [Department of Zoology, Andhra University, Waltair, India.] "Observations on the Mehlis' gland complex in the liver fluke *Fasciola hepatica* L." **Journal of Parasitology**, 45 (3), 347-351.

Rao describes and gives a diagram of the Mehlis' gland complex in *Fasciola hepatica*. An ootype with cellular walls is shown to be present but egg-shell formation does not take place in it, no shell granules being liberated from the vitelline cells until they have passed beyond the uterine valve into the uterus proper. It is suggested that the secretion from Mehlis' gland may stimulate the vitelline cells to release the egg-shell forming substance. The vitelline cells contain glycogen masses and granules which stain bright blue with Azur-Schiff and pale bluish-green with Aqueous Azur; these granules have all disappeared by the time egg-shell formation is complete. The paper is illustrated by photomicrographs. S. Willmott

- 293—RITTERSON, A. L., 1959. [University of Rochester School of Medicine and Dentistry, U.S.A.] "Observations on the nature of the cyst of *Trichinella spiralis*." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 36.

- 294—SARWAR, M. M., 1959. [College of Animal Husbandry, Lahore, West Pakistan.] "A redescription of some little known species of *Trichuris*." **Biologia. Lahore**, 5 (1), 48-62.

Sarwar redescribes *Trichuris spiricollis*, *T. discolor*, *T. unguiculatus*, *T. tenuis* and *T. vondweii* and discusses the synonymy of each species. M. M. Sarwar

- 295—SINGH, K. S. & SINGH, K. P., 1960. [Post Graduate College of Animal Sciences, Indian Veterinary Research Institute, Mukteswar (Kumaon), U.P., India.] "Morphology and histochemistry of interproglottidal glands of *Moniezia expansa*." **Indian Journal of Helminthology**, Year 1958, 10 (2), 111-131.

In *Moniezia expansa*, 6 to 38 (average 16) rounded or rosette-shaped inter-proglottidal glands lie along and close to the posterior margin of the proglottis but do not extend to the lateral margins. The glands measure 0.03 mm. to 0.155 mm. in diameter, are composed of numerous large cells which are grouped and open into a short, wide gland duct which, in turn, opens into the base of a dorso-ventral groove. This groove joins the proglottides to each other along their breadth and both this groove and the gland duct are lined by two layers of cuticle. The authors have also studied the histochemistry of the glands by general tests and by numerous reactions for individual compounds. G. I. Pozniak

Life-Cycle and Development

- 296—ALICATA, J. E. & NODA, K., 1959. [University of Hawaii.] "The life history of a species of *Philophthalmus*, an eye-fluke of birds in the Hawaiian Islands." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 22.

- 297—ANDERSON, R. C., 1960. [Department of Parasitology, Ontario Research Foundation, Toronto 5, Ontario, Canada.] "Correction to a previous paper." **Canadian Journal of Zoology**, 38 (3), 677.

Anderson points out that although the error in the name of the host of *Ornithofilaria fallisensis* Anderson, 1954 was corrected later (Anderson, 1956) [for abstract see Helm. Abs., 25, No. 204b] the error has been repeated by many foreign helminthologists and he repeats that the type host is not the domestic goose (*Anser domesticus*) but the white Pekin duck (*Anas boschas domesticus*). W. G. Inglis

- 298—BACHA, Jr., W. J., 1960. [New York University, U.S.A.] "An experimental study of the caecal trematode *Zygocotyle lunata* in the white rat with respect to host resistance, excystation, and transplantation." **Dissertation Abstracts**, 20 (8), 3028.

- 299—BEARUP, A. J., 1958. [School of Public Health and Tropical Medicine, University Grounds, Sydney, New South Wales, Australia.] "Trematode parasites in estuarine fish." [Correspondence.] **Australian Journal of Science**, 20 (7), 219-220.

Heterophyid cercariae in the mollusc *Pyrazus australis* became metacercariae in the muscles of numerous species of estuarine fish (*Gambusia* and *Atherinosoma*); when infected fish were fed to young gulls (*Larus novae-hollandiae*) adult trematodes developed and proved to be *Stictodora* sp. H. McL. Gordon

- 300—BERTRAM, D. S., 1959. [Department of Entomology, London School of Hygiene and Tropical Medicine, London, W.C.1.] "Host-parasite relationships in the arthropod-borne filarioid infections." **International Congress of Zoology** (15th), London, July 16–23, 1958. Proceedings, pp. 689–690. [Discussion p. 690.]

Bertram points out that until recently the fate of filarioid worms transmitted to man could not be studied experimentally because man was the only host. The discovery, however, of *Wuchereria malayi* and *malayi*-type infections in other mammals in Malaya and of *malayi*-type in animals in East Africa has opened up the way for experimental studies on host-parasite relationships. In addition much work has been done on the filarioid parasite of cotton-rats and of particular interest is the observation that there is frequently a lack of correlation between the number of adult worms and the microfilarial count.

S. Willmott

- 301—BUTTNER, A. & VACHER, C., 1959. [Institut de Parasitologie, Faculté de Médecine de Paris, France.] "Evolution d'un *Plagiorchis* s'enkystant chez *Gammarus pulex* L., et identifié à *Plagiorchis cirratus* (Rud. 1802) (Trematoda—Plagiorchiidae)." **Comptes Rendus des Séances de la Société de Biologie. Paris**, 153 (11), 1712–1718.

Buttner & Vacher describe and illustrate the life-history of *Plagiorchis cirratus*. Metacercariae were found in nature in *Gammarus pulex* in the vicinity of the Richelieu Experimental Station, and produced experimentally in *G. pulex* and *Asellus aquaticus* by exposure of the crustaceans to xiphidiocercariae emerging from naturally-infected *Lymnaea stagnalis* and *L. (Radix) limosa*. Experimentally produced metacercariae matured in 12 to 15 days, and developed into ovigerous adults within four days of feeding to white laboratory mice. The authors note that while *P. cirratus* is widely known from birds in Europe and Asia, it has not been found in birds and mammals examined during the last 30 years at the Richelieu Station; its vertebrate host in that area is therefore not known.

E. I. Sillman

- 302—CHABAUD, A. G. & CAMPANA-ROUGET, Y., 1959. [Institut de Parasitologie, Faculté de Médecine de Paris, France.] "Notes sur le trématode hémiuride *Sterrhurus fusiformis* Lühe 1901 et sur sa cercaire (? *Cercaria vaullegeardi* Pelseneer 1906)." **Vie et Milieu. Paris**, 10 (2), 168–175.

Although they have not established experimental infections, Chabaud & Campana-Rouget conclude from their observations that four hosts play a part in the life-history of *Sterrhurus fusiformis*. The first, in which cercariae apparently identical with *Cercaria vaullegeardi* Pelseneer, 1906 occur in sporocysts or, more accurately, pseudo-sporocysts, is *Gibbula varia* and possibly *G. cineraria*. The second, perhaps a copepod, remains unknown although numerous copepods, harpacticids, isopods, amphipods, decapod larvae and annelids, etc. living in the aquarium with infected conger eels and *Gibbula* were examined. In one instance the ejection mechanism was observed and is described. The third hosts are *Gobius* spp., *Blennius* spp., *Labrus* spp. and probably other fish which eat the metacercariae. The fourth host is *Conger conger* and in the Banyuls-sur-Mer region almost all have numerous *S. fusiformis* in their stomachs. The paper is illustrated with line drawings.

S. Willmott

- 303—CHENG, T. C. & JAMES, H. A., 1960. [Department of Biology, Lafayette College, Easton, Pennsylvania, U.S.A.] "Studies on the germ cell cycle, morphogenesis and development of the cercarial stage of *Crepidostomum cornutum* (Osborn, 1903). (Trematoda: Allocreadiidae)." **Transactions of the American Microscopical Society**, 79 (1), 75–85.

Cheng & James describe and figure the structure and development of the mother and daughter rediae and the cercaria of *Crepidostomum cornutum* obtained respectively from *Sphaerium striatinum* and *Cambarus bartoni sciotensis*. This very detailed paper does not lend itself to abstraction, but the following points are of interest: (i) the formation of the membrane which surrounds the germ balls represents the separation of the ectoderm from the meso-entoderm and is homologous with the laying down of the ectodermal plates in the miracidial stage; (ii) the exact time when the meso-entoderm separates into two distinct germ layers is not clear; (iii) the somatic cells of the germ ball give rise to all three germinal layers, but which cell or cells are the precursors is unknown; (iv) the development of the tail is discussed at considerable length and it is concluded that this provides a criterion for the separation of taxa which should be accepted only with reservation. The embryonic development of the cercarial stage in digenetic trematodes is in need of much more extensive study before it can be used as the basis of any phylotaxic conclusions.

J. M. Watson

- 304—CHERNOGORENKO-BIDULINA, M. I. & BLIZNYUK, I. D.**, 1960. [Institut hidrobiologii, Akademiya Nauk, U.S.S.R.] [The life-cycle of *Sphaerostoma bramae* Müller, 1776.] **Doklady Akademii Nauk SSSR**, **134** (1), 237-240. [In Russian.]
Chernogorenko-Bidulina & Bliznyuk, on examination of a large number of *Bithynia leachi* found *Sphaerostoma bramae* sporocysts, containing cercariae of the short-tailed, tailless and encysted forms, in the liver of one of the snails. Sporocysts, containing only encysted cercariae were found in the liver of the same snail and in those of many others. This form of cercaria was also found outside sporocysts. Another snail harboured a sporocyst containing two tailless cercariae, two metacercariae, one sexually mature form of *S. bramae* and numerous eggs containing developed miracidia in addition to two metacercariae without eggs and one sexually mature form with eggs. It is mentioned *inter alia* that *Cercaria micrura* were found fairly frequently in the liver and sexual glands of other *B. leachi*, both within and without sporocysts. The mature form contained only five eggs. The authors conclude that the developmental cycle of *S. bramae* is double, i.e. (i) with an intermediate host and a supplementary host, respectively a mollusc and a leech; (ii) with only one intermediate host, a mollusc. The possibility of a third type of development in which the intermediate and supplementary hosts are molluscs of the same species is not excluded. The paper is illustrated with three diagrams.
N. Jones
- 305—CRANDALL, R. B.**, 1959. [Purdue University, U.S.A.] "The life history of the turtle lung fluke, *Heronimus chelydrae* MacCallum." [Abstract.] **Journal of Parasitology**, **45** (4, Sect. 2), 18.
- 306—DINNICK, J. A.**, 1959. [East African Veterinary Research Organization, Muguga, Kenya.] "The succession of redial generations in the development of Paramphistomatidae and *Fasciola* species in a snail host." **International Congress of Zoology** (15th), London, July 16-23, 1958. Proceedings, pp. 671-672. [Discussion p. 672.]
Dinnick has observed that in *Paramphistomum microbothrium*, *P. sukari* and *Fasciola gigantica* the first generation rediae produce daughter rediae, then cercariae and then repeat both phases. Rediae of subsequent generations also show this alternating development. In *P. lerouxi* and *Carmynerius exoporus* the first generation rediae give rise to numerous cercariae at first and later to a few daughter rediae as well. Succeeding generations of rediae also gave birth to cercariae and a few daughter rediae.
S. Willmott
- 307—DOUGLAS, J. R. & BAKER, N. F.**, 1959. [University of California, Davis, U.S.A.] "The chronology of experimental intrauterine infections with *Toxocara canis* (Werner, 1782) in the dog." [Abstract.] **Journal of Parasitology**, **45** (4, Sect. 2), 43-44.
- 308—ETGES, F. J.**, 1959. [University of Cincinnati, U.S.A.] "Studies on the life history of a species of *Acanthatrium* (Trematoda: Lecithodendriidae)." [Abstract.] **Journal of Parasitology**, **45** (4, Sect. 2), 18.
- 309—GRABDA, B.**, 1959. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "The life-cycle of *Astiotrema trituri* B. Grabda, 1959 (Trematoda; Plagiorchiidae)." **Acta Parasitologica Polonica**, **7** (23/35), 489-498. [Polish summary p. 498.]
The life-cycle of *Astiotrema trituri* has been traced experimentally and the sporocyst, cercaria and metacercaria are described and figured. Sufficient eggs were not available successfully to infect *Coretus corneus*. The natural infection rate of these snails was 21.4%. The cercariae, which belong to "*Cercariae armatae*" subgroup "*Polyadena*", produced high infections in the Cladocera *Simocephalus expinosus* and *Eurycercus lamellatus*, but only 4 out of 100 *Ceriodaphnia reticulata* and none of 100 *Daphnia magna* became infected. The metacercariae had already become infective on the second day and were successfully used to infect larval *Triturus vulgaris*. These passed eggs after two weeks and the first fully mature fluke was obtained one month after infection. This fluke is a parasite of the larvae of *T. vulgaris* (48.5% naturally infected) rather than of the adults (9.8% infected).
G. I. Pozniak

- 310—HALL, J. E., 1959. [Department of Microbiology, Medical Center, West Virginia University, Morgantown, West Virginia, U.S.A.] "Studies on the life history of *Mosesia chordeilesia* McMullen, 1936 (Trematoda: Lecithodendriidae)." **Journal of Parasitology**, 45 (3), 327–336.

Hall emends the diagnosis of *Mosesia* to include *M. chordeilesia* and gives a detailed account of the life-history of this species. The cercaria, which is identified with *Cercaria neustica*, develops in *Goniobasis livescens* and *Pleurocera acuta*; it is characterized by the arrangement of the cephalic gland ducts, the smaller virgula organ, the shape of the stylet and the very slightly dissimilar texture and staining reactions of the cephalic glands. The primary excretory pores are in the body-tail furrow. Cercariae entered and encysted in larvae of *Sialis* sp. and naiads of *Hexagenia limbata*; the penetration period was not observed but numerous unencysted, or recently encysted, forms were found in the haemocoel four to five hours after exposure. In encysted forms the virgula and first pair of cephalic glands were largely depleted. The metacercaria is described. A peculiar phenomenon was observed in mayfly naiads and subimagines examined after infections were 74 days old; the tough inner cyst wall was frequently altered, being thinner than in younger metacercariae or in several pieces held together by the adventitious layer or it had thinned and disappeared adjacent to the anterior end of the trematode. When the mayfly was killed these metacercariae emerged spontaneously or could easily be induced to do so; however, they never emerged in the living insect even when held for several weeks after the age at which the cyst wall became weakened. Adults were obtained in experimentally infected chicks and a hamster. The flame cell formula of cercaria and adult is $2[(2+2+2)+(2+2+2)]$.

S. Willmott

- 311—HENNER, S., 1959. "Untersuchungen über Häutungen von Larven verschiedener Askaridenarten während ihrer präparasitischen Phase." **Dissertation, Munich**, 38 pp.

- 312—HOFFMAN, G. L., 1959. [Eastern Fish Disease Laboratory, U.S. Fish and Wildlife Service, Kearneysville, West Virginia, U.S.A.] "Studies on the life cycle of *Neogogatea pandionis* Chandler and Rausch, 1948 (Trematoda: Strigeoidea: Cyathocotylidae)." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 19.

- 313—ISHII, T., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Studies on larva migrans. 2. Comparative studies on migratory behaviour and larval morphology of *Toxocara canis* and *Ascaris suilla*, with regard to their re-infectivity.] **Japanese Journal of Parasitology**, 8 (4), 558–566. [In Japanese: English summary p. 566.]

Eggs of *Toxocara canis*, given to mice, hatched in the digestive tract. Larvae migrated to the liver, then to the lung and finally to the brain or muscles. During this period no morphological changes were observed, except the development of lateral lines. Only second-stage larvae were obtained in mice. With pig *Ascaris*, the migration route was from the liver to the lung and then to the digestive tract. A marked increase in length and width of the worm body was noted during the migration; the digestive organs also showed remarkable development and larvae developed to the third stage. Canine ascarid larvae, isolated from the organs of infected mice, were always infective to other mice, although no further morphological differentiation other than the second-stage larvae was noted. In the case of pig ascarids, the second-stage larvae, isolated from the organs of mice within one day of an infection, could infect other mice, but more mature larvae lost their second infectivity.

Y. Yamao

- 314—ISHII, T., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Studies on larva migrans. 3. Hatchability of *Toxocara canis* in the earthworm.] **Japanese Journal of Parasitology**, 8 (5), 659–663. [In Japanese: English summary p. 663.]

Embryonated eggs of *Toxocara canis* were dispersed on damp soil containing earthworms (*Pheretima* sp.). Three weeks later many second-stage larvae of *T. canis* were found in the tissues of the earthworms.

Y. Yamao

- 315—JARECKA, L., 1959. [Zakład Parazytologii, Uniwersytet Warszawski, Warszawa, Krakowskie Przedmieście 26/28, Poland.] "On the life-cycle of *Bothriocephalus claviceps* (Goeze, 1782)." **Acta Parasitologica Polonica**, 7 (23/35), 527–532. [Polish summary p. 532.]

Eggs of *Bothriocephalus claviceps*, hatched in culture in five to six days, were used to infect eight species of Copepoda which are common in the Lakes Mamry and Goldapiwo. Heavy

infections were obtained in *Macrocyclus albidus* (natural infections confirmed this species as the principal intermediary) and slight ones in *M. fuscus*, *Eucyclops macruroides* and *E. macrurus*. Proceroids developed in 10 to 12 days, had elongated bodies, relatively large cercomers, no hairs or bristles on the front body and anterior ends which resembled the adult head. During the 1st to 14th day of observations on experimentally infected fry of Cyprinidae, the proceroids, having shed the cercomer during the first day, neither grew nor penetrated into the body-cavity. Neither the Cyprinidae fry nor older *Carassius carassius* showed any infection on examination after two months. No plerocercoids were found in fish in the two lakes and it is concluded that the cycle does not require a second intermediary.

G. I. Pozniak

- 316—JARECKA, L., 1960. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "Life-cycles of tapeworms from lakes Goldapiwo and Mamry Północne." **Acta Parasitologica Polonica**, 8 (1/7), 47–66. [Polish summary p. 66.]

Jarecka records the larval tapeworm fauna collected from pelagic and littoral Crustacea in the Goldapiwo and Mamry Północne lakes. She describes the eggs and larvae and presents data on the life-cycles of *Proteocephalus* sp., *P. percae*, *P. macrocephalus*, *Hymenolepis aequabilis*, *H. macrocephala*, *H. compressa*, *H. abortiva*, *H. sacciperium*, *Drepanidotaenia bisacculina*, *Aploparaksis furcigera* and *Tatria acanthorhyncha*. For *Paricterotaenia porosa* and an unnamed species of *Diorchis* she describes the eggs only. She compares the fauna to that found by her in 1958 in Lake Družno.

G. I. Pozniak

- 317—KARMANOVA, E. M., 1960. [Laboratoriya gelmintologii, Akademiya Nauk SSSR, Moscow.] [The life-cycle of the nematode *Diectophyme renale* (Goeze, 1782), parasitic in the kidneys of carnivorous mammals and man.] **Doklady Akademii Nauk SSSR**, 132 (5), 1219–1220. [In Russian.]

Karmanova has infected a three-month-old puppy with six infective larvae of *Diectophyme renale* from *Lumbriculus variegatus*. On autopsy 62 days later six adult but not yet mature worms were present in the abdominal cavity. Another dog aged four years was given six larvae in food or water in the course of two days and after 138 days passed eggs in the urine. Autopsy on the 156th day revealed three males and two females—one in the right kidney. These results show that, as in other Diectophymata, one intermediary (an oligochaete) is necessary for the completion of the life-cycle of *D. renale* and that a second intermediary (a fish) is not obligatory.

G. I. Pozniak

- 318—KOVALENKO, I. I., 1960. [Ukrainski nauchno-issledovatelski institut eksperimentalnoi veterinarii, Kharkov, U.S.S.R.] [Study of the life-cycles of some helminths of domestic ducks from farms on the Azov coast.] **Doklady Akademii Nauk SSSR**, 133 (5), 1259–1261. [In Russian.]

Kovalenko reports *Gammarus* (*Pontogammarus*) *maeoticus* and *G. locusta* as new intermediate hosts of *Streptocara crassicauda*, *Tetrameres fissispina* and *Polymorphus magnus* in the coastal zone of the Azov sea. Larvae found were used in experimental infections of ducklings. Infective larvae survived the winter in their hosts. Examination of 2,108 specimens of fishes revealed the following species to be reservoir hosts of *S. crassicauda* and of *T. fissispina*: *Caspialosa brashnikovii* *maeotica*, *Lucioperca lucioperca*, *Neogobius melanostomus*, *N. fluviatilis*, *Rutilus rutilus* and *Scardinius erythrophthalmus*; positive results were obtained with experimental infections of ducks with larvae recovered from these fish. Bream and needle-fish were not found infected.

N. Jones

- 319—LITTLE, M. D., 1959. [Tulane University, U.S.A.] "Insects as possible paratenic hosts of *Ancylostoma caninum*." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 36.

- 320—LLEWELLYN, J., 1959. [Department of Zoology and Comparative Physiology, University of Birmingham, U.K.] "The larval development of two species of gastrocotylid trematode parasites from the gills of *Trachurus trachurus*." **Journal of the Marine Biological Association of the United Kingdom**, 38 (3), 461–467.

Larval and immature stages of *Gastrocotyle trachuri* and *Pseudaxine trachuri* occur on *Trachurus trachurus* at Plymouth in May; only adult parasites are found in July and August, suggesting a seasonal rhythm in reproduction. Although the larval forms are commoner on young

fish, those over two years old are still susceptible. In both *G. trachuri* and *P. trachuri* the first post-oncomiracidial stage is bilaterally symmetrical and provided with a pair of relatively large post-oncomiracidial hooks. The presence of pigment cells in the gut indicates that the larvae are blood-feeders. Asymmetrical development commences with the formation of the first clamps. Egg capsules yielding oncomiracidia were collected from *G. trachuri* with 19 clamps, the maximum number of clamps being 35 to 40. The vitellarium and ootype become functional before the testes and germarium. The differences in development of the two species are described and discussed. S. Willmott

- 321—MARTIN, W. E., 1959. [Biology Department and Allan Hancock Foundation, University of Southern California, U.S.A.] "Egyptian heterophyid trematodes." **Transactions of the American Microscopical Society**, 78 (2), 172-181.

Three types of *Heterophyes* cercariae were obtained from *Pirenella conica* from Little Bitter Lake (Egypt); two were larger and one of these was very heavily pigmented; the third was small. *Mugil cephalus* from the Gulf of California were exposed to these and infected mullet subsequently fed to cats. The small cercaria developed into *H. aequalis*. The two larger cercariae developed into *H. heterophyes* but the specimens developing from the heavily pigmented cercariae had 77-90 spined bars on the gonotyl whereas those from the diffusely pigmented cercariae had only 60-73. Martin therefore suggests that *H. heterophyes* may represent two species or subspecies. Cercariae of two species of *Stictodora* are also described and metacercariae of *S. tridactyla* were found in *Aphanius fasciatus* from Lake Burullus. A fourth heterophyid cercaria which occurred rarely in *P. conica* is described and tentatively assigned to the haplorchid group. Metacercariae of *Centrocestus cuspidatus* were found in the gills of some small *Gambusia* collected in a canal near Qarun Lake and young chicks were successfully infected with them. S. Willmott

- 322—OMORI, N., 1957. [Laboratory of Sanitary Zoology, Institute of Endemic Diseases, Nagasaki University, Nagasaki, Japan.] [Experimental studies on the role of the house mosquito, *Culex pipiens pallens* in the transmission of bancroftian filariasis. I. Development, distribution and longevity of filariae in mosquitoes kept at 27 °C. and 25 °C.] **Nagasaki Medical Journal**, 32 (11), 1434-1445. [In Japanese.]

In *Culex pipiens pallens*, cultured at 27°C. and 25°C., *Wuchereria bancrofti* required at least 12 and 14 days respectively to complete development. The first and second stages of development took place in the thoracic muscles. At the third stage, they moved into the body-cavity freely. Infective larvae tended to invade the tissues, organs and appendages. That infective larvae were concentrated in the proboscis is explained by their general migratory and tissue invasion tendencies, rather than by their settling there after completing a definite route of migration. The invasion of human skin by the larva might also be explained as a manifestation of the larva's general invasive character. Y. Yamao

- 323—OMORI, N., 1958. [Department of Medical Zoology, Research Institute of Endemics, Nagasaki University, Nagasaki, Japan.] [Experimental studies on the role of the house mosquito, *Culex pipiens pallens* in the transmission of bancroftian filariasis. 2. On the pattern of spatial distribution of microfilaria in the peripheral blood stream of the carrier.] **Nagasaki Medical Journal**, 33 (8), 1045-1053. [In Japanese: English summary pp. 83-84.]

Culex pipiens pallens, the confirmed vector of *Wuchereria bancrofti* in Japan, was allowed to feed on a carrier. The populations of microfilariae in engorged females were investigated just after their ingestion of the infective blood meal. In the peripheral blood vessels of the carrier, during the incipient phase of periodicity or in cases in which microfilariae were as few as one or two in 20 cu.mm. of blood, the frequency distribution of microfilariae per engorged female agreed with the Poisson distribution. When the numbers of microfilariae became a little larger, the frequency distribution tended towards the Pólya-Eggenberger type. In other words, in the former microfilariae were distributed at random or homogeneously, while in the latter they were distributed in an aggregation or patch type. The aggregation appeared to become

more complicated with increase in number of microfilariae. Omori concluded that this was the reason why the number of microfilariae in the engorged female was subject to great variation.
Y. Yamao

324—ORIHIEL, T. C., 1960. [Tulane University, U.S.A.] "The development and morphology of the larval stages of *Dirofilaria immitis* (Leidy, 1856) Railliet and Henry, 1911 and *Dirofilaria tenuis* Chandler, 1942." **Dissertation Abstracts**, **20** (9), 3904.

325—OTA, S., 1957. [Yamanashi Prefectural Institute of Medicine, Kofu, Japan.] [Studies on the development of *Schistosoma japonicum* within the mollusc host, *Oncomelania nosophora*.] **Kitakanto Medical Journal**, **7**, 700–719. [In Japanese.]

Oncomelania nosophora were experimentally infected with the miracidia of *Schistosoma japonicum* in the laboratory as well as in the field. Miracidia were able to invade snails at any part of the body surface, favouring the foot, proboscis, mantle and gill. When miracidia invaded through the gill, most were carried by the blood stream into the connective tissues surrounding the reproductive, excretory and digestive organs or mid-gut gland. When the invasion was through the foot or mantle there was scarcely any migration. All the miracidia became mother sporocysts in parenchymatous tissues, loose connective tissue or reticular tissue, or in the lymph cavity. Daughter sporocysts produced from the mother sporocysts migrated into the lymph cavity or reticular tissue and matured there. Daughter sporocysts began to be produced six to seven weeks after the infection in the laboratory in the spring, and three to four weeks after infection in the field in summer. Tissue destruction of the snails was caused by the development of mother sporocysts, and migration and development of daughter sporocysts.
Y. Yamao

326—PETTER, A. J., 1960. [Institut de Parasitologie, Faculté de Médecine, Paris, France.] "La blatte germanique (*Blattella germanica* L.), hôte intermédiaire probable d'*Abbreviata caucasica* (Linstow, 1902), nématode parasite des primates et de l'homme." **Comptes Rendus des Séances de la Société de Biologie, Paris**, **154** (1), 87–90.

Petter found embryonated eggs, resembling those of *Abbreviata caucasica*, in the faeces of captive gorillas. Encapsulated physalopterid larvae were found on the intestinal wall of *Blattella germanica* which were collected in the cages. Eight of these larvae were fed to a young white rat and three weeks later three *Abbreviata* larvae were recovered from its stomach. It is believed that the *B. germanica* were infected with the eggs from the faeces of the gorillas and that the parasite in question is *A. caucasica*. This hypothesis is confirmed by the fourth-stage larvae (from the rat) which had four uteri and a series of small intermediate teeth between the lateral tooth and the sub-median teeth. The author identifies this larva with that found by Chabaud in 1954 in the stomach of *Bufo mauritanicus*, but not with that which he found in *Morica planata* which was much bigger and did not have sub-lateral teeth.
N. Jones

327—RICHTER, S., 1960. [Institut za veterinarsko-medicinska istraživanja, Zagreb, Yugoslavia.] "Posrednik za razvoj *Streptocara pectinifera* (Neumann, 1900), razvojni ciklus i način invazije." **Veterinarski Arhiv**, **30** (3/4), 86–92. [English and German summaries pp. 89–92.]

Richter examined 20 *Cyclops strenuus*, 70 *Daphnia pulex*, 75 *Asellus aquaticus*, 48 *Procladius tessellatus*, some undetermined species of leeches and 1,000 *Gammarus* (*Rivulogammarus*) *triacanthus* from the River Odra during 1958. Developmental stages of *Streptocara pectinifera* were found mainly in *G. (R.) triacanthus* (20%). These fresh-water shrimps also contained developmental stages of *Polymorphus boschadis* and of some *Hymenolepis* species. The characteristics of *S. pectinifera* larvae are described in detail and some of them are: (i) transverse cuticular striations; (ii) the cylindrical muscular part of the oesophagus narrower anteriorly; (iii) subterminal anus; (iv) posterior part of the body slightly curved dorsally and terminating in a small bright cuticular formation. 18-day-old ducks and chickens were experimentally infected in the first experiment. Experimental infections were successfully established in chickens and ducks using isolated larvae or infected *Gammarus*. Adult *S. pectinifera* were recovered from the mucous membrane of the oesophagus and/or gizzard from the 12th day after infection.
N. Jones

- 328—SCHWARTZ, B., 1959. [Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland, U.S.A.] "Experimental infection of pigs with *Ascaris suum*." **International Congress of Zoology** (15th), London, July 16-23, 1958. Proceedings, pp. 684-685. [Discussion pp. 685-686.]

Schwartz reports the successful experimental infection of well fed young pigs with *Ascaris suum*. A significant observation was the spontaneous elimination of worms over a variable period, beginning the fourth week of infection. This corresponds to the initiation of the fourth moult. The pigs were infected either by means of eggs cultured in water or 0.5% aqueous formalin or by feeding them the lungs of infected guinea-pigs. The life-cycle of both *A. suum* and *A. lumbricoides* is essentially diphasic and the migratory phase is probably of phylogenetic significance.
S. Willmott

- 329—SHORB, D. A. & SHALKOP, W. T., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Possible significance of the retention of immature larvae of *Oesophagostomum quadrispinulatum* (*O. longicaudum*) in the intestinal mucosa of swine after single infections." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 41-42.

- 330—SMYTH, J. D., 1959. [Department of Zoology, Canberra University College, Canberra, Australia.] "Maturation of larval pseudophyllidean cestodes and strigeid trematodes under axenic conditions; the significance of nutritional levels in plathyhelminth development." **Annals of the New York Academy of Sciences**, 77 (2), 102-125.

Smyth discusses the problems associated with the axenic culture of pseudophyllidean cestodes and strigeid trematodes. Essentially, these are the provision and maintenance of axenic physico-chemical conditions simulating those present in the normal host, the supply of suitable nutrients, efficient removal of metabolic waste materials and the establishment of suitable criteria for assessing the development of the parasite. He reviews previous work by various authors and describes some recent experiments. Embryonated eggs of *Schistocephalus solidus* were hatched by exposure to sunlight and the emerging coracidia were maintained in embryo extract (EE₂₀) at room temperature. No differentiation was obtained in the two to three hours' survival time. The author suggests that the presence of the embryophore, which is removed in the copepod gut, may prevent absorption of nutrients. Embryo extract was shown to stimulate growth in the plerocercoid of *Dipyllobothrium dendriticum* but knotting of the strobilae in growth-producing media caused some difficulties. In spite of this, specimens in the yolk sac or amniotic cavity of developing chicks or ducks reached a stage of complete segmentation and early organogeny. Specimens in dilute embryo extract (EE₁₀) reached a more advanced stage of organogeny. To overcome the problem of strobila knotting, 1 mm. to 2 mm. fragments excised from the posterior quarter of undifferentiated plerocercoids were cultured. It was shown that development was most advanced in EE₂₀ where the stage of late gametogeny was reached, spermatozoa being formed in some cases. In no artificial medium was satisfactory development of vitellaria obtained and it is doubtful whether real cytoplasmic growth took place. The nutrients essential for these processes had clearly not been provided in the media used. In protein reinforced with avian egg yolk, metacercariae of *Diplostomum phoxini* showed mitosis counts which reached and sometimes exceeded the *in vivo* level (200). Gametogenesis occurred under these conditions. Active spermatozoa were released and eggs appeared in the uterus. Histochemical reactions suggested that the egg-shells were imperfectly formed. The vitellaria were poorly developed and had a low content of phenol-protein egg-shell precursors. It is suggested that the nutrients necessary for such precursor formation may be of the type required by collagen-forming systems.
J. E. D. Keeling

- 331—SOOD, S. M., 1960. [Department of Parasitology, U.P. College of Veterinary Science and Animal Husbandry, Mathura, India.] "On a hitherto unrecorded observation regarding the sheep nodular worm infection." **Indian Veterinary Journal**, 37 (6), 303-305.

Secondary migration was observed by both juveniles and adults of *Oesophagostomum columbianum* in the Indian goat. Sections through nodules with fourth-stage larvae revealed a fifth stage—the early juvenile with developing gonads—which, as seen from the mechanical damage to the intestinal lining, had entered the nodule from the lumen. Adults were observed

to penetrate rather deeply into the mucosa with parts of the body protruding into the lumen and to cause erosion and desquamation of the surface epithelium with the development of necrotic areas in the mucosa. Photomicrographs illustrate the two cases. G. I. Pozniak

332—SPRENT, J. F. A., 1959. "Observations on the development of ascaridoid nematodes of the carpet snake." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 35.

333—STUNKARD, H. W., 1959. [American Museum of Natural History, New York, N.Y., U.S.A.] "Specific determination in the trematode genus, *Gymnophallus*." **International Congress of Zoology** (15th), London, July 16–23, 1958. Proceedings, pp. 672–674. [Discussion p. 674.]

No complete life-history in the genus *Gymnophallus* has yet been worked out. Although comparisons of cercariae, metacercariae and adults have often been made, in the absence of experimental evidence no certain identification of one stage with another can be made. It would also be of interest to know if members of a given species can develop in more than one location in the host and to what extent the species of host affects the development and morphology of the parasite. Stunkard reports that in an attempt to infect various hosts with metacercariae from *Mytilus edulis* of the New England coast only recently hatched chicks of *Somateria mollissima* proved susceptible. Metacercariae transferred from *M. arenaria* to *M. edulis* and *Hiattella arctica* were not recovered. S. Willmott

334—STUNKARD, H. W., 1959. [U.S. Fish and Wildlife Service and the American Museum of Natural History, New York, U.S.A.] "Progenetic maturity and phylogeny of digenetic trematodes." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 15.

335—TAKAHASHI, T., 1959. [Department of Biology, Schowa Medical School, Tokyo, Japan.] [Studies on *Diphyllbothrium mansoni*. 1. Life-cycle and host specificity.] **Japanese Journal of Parasitology**, 8 (4), 567–574. [In Japanese: English summary p. 572.]

Plerocercoids obtained from snakes, *Natrix tigrina*, were given to dogs and 10 days later eggs were found in the faeces. These eggs were given to *Cyclops* which were injected into mice intraperitoneally and intradermally. The plerocercoids obtained from the mice were given to dogs and grew into *Diphyllbothrium mansoni*. The proceroids did not infect goldfish and *Triturus pyrrhogaster* but became plerocercoids in hamsters. Decapitated plerocercoids could not regenerate in the subcutaneous tissue of a mouse or *Bufo vulgaris*. In a dog, a plerocercoid moved from the stomach to the duodenum in half to one hour. In 24 hours the sucking groove became differentiated, in 96 hours the structure of the strobila became apparent and in 172 hours egg production was noted. When plerocercoids, obtained from mice, were given to mice again, they appeared in the peritoneal cavity in less than 40 minutes and later moved to the subcutaneous tissue in the region of the head and shoulders. When immature worms, isolated from the final hosts within 48 hours of infection, were transplanted into the subcutaneous tissue of mice, some of them reverted to the plerocercoid stage; these showed the same infectivity to the dogs as the normal plerocercoid. Y. Yamao

336—TOYAMA, H., 1957. [Department of Public Health, Tottori University School of Medicine, Yonago, Japan.] [Ecological studies on the larvae of *Wuchereria bancrofti* in the mosquito (*Culex pipiens*).] **Journal of the Yonago Medical Association**, 8 (3), 355–408. [In Japanese.]

The optimum temperature for the development of *Wuchereria bancrofti* in *Culex pipiens* was 30°C. at which they completed their development within 10 days. At 25°C. development required 14 days and it was never completed at 33.5°C. and 15°C. Humidity had no effect on development at the optimum temperature. 56.2% to 70.6% of infective larvae were found in the proboscis at the optimum temperature and the remainder in the thoracic and abdominal region. *Culex tritaeniorhynchus* were fed with microfilariae of *W. bancrofti* and kept at the optimum temperature for 24 days. When examined only first-stage larvae were found. Y. Yamao

337—TRIAANTAPHYLLOU, A. C., 1960. [North Carolina State College, U.S.A.] "Variation, post-infection development and sex determination in *Meloidogyne incognita*, and oogenesis in some *Meloidogyne* species." **Dissertation Abstracts**, 20 (8), 3014–3015.

- 338—VAN WEERDT, L. G., 1960. [State Plant Board of Florida, Gainesville, Florida, U.S.A.] "Studies on the biology of *Radopholus similis* (Cobb, 1893) Thorne, 1949. Part III. Embryology and post-embryonic development." *Nematologica*, 5 (1), 43–52. [German summary p. 52.]
Van Weerd describes in detail and illustrates the development of *Radopholus similis* from the undivided egg through the four larval stages to the mature male and female. After cleavage of the egg had started a polar body became apparent in the extra-vitellar cavity and was always located at the anterior pole. First-stage larvae moult inside the egg shell. Second-stage larvae partly develop inside the egg and then hatch and undergo further increase in body and stylet length. At this stage male and female larvae can be differentiated by the arrangement of the cells in the genital primordia. In the third and fourth stage of larval development there is a general increase in size and further differentiation of the gonad cells. At the fourth moult males do not increase in length, the heavy, sclerotized cephalic framework and strong stylet is replaced by an offset unsclerotized head, a weak, probably non-functional stylet and an underdeveloped oesophageal region. Females emerge with fully formed gonads but they undergo further increase in size and development, the anterior ovary usually being longer than the posterior. D. J. Hooper
- 339—WAGNER, A., 1960. [Florida State University, U.S.A.] "Stimulation of *Schistosomatium douthitti* cercariae to penetrate their host." *Dissertation Abstracts*, 20 (8), 3449.
- 340—WEHR, E. E. & HWANG, J. C., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Further observations on the life history and development of *Ascaridia columbae* (Gmelin, 1790) Travassos, 1913, in the pigeon." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 43.
- 341—WEST, Jr., A. F. & FISHER, Jr., F. M., 1959. [Purdue University, U.S.A.] "The life history of a species of *Philophthalmus* (Trematoda: Philophthalmidae) from the orbit of birds." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 60.
- 342—YAMASHITA, M., 1958. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [Experiment on mode of infection of hookworms in human body.] *Igaku Kenkyu. Fukuoka*, 28 (7), 2434–2439. [In Japanese: English summary p. 2439.]
Mature infective larvae of *Ancylostoma duodenale* and *Necator americanus* were given to four volunteers through the mouth or skin. Yamashita's result showed that the larvae of *A. duodenale* could invade the human body either through the mouth or the skin, and those of *N. americanus* through the skin but not through the mouth. Y. Yamao
- 343—YOSHIDA, Y., 1959. [Department of Medical Zoology, Kyoto Prefectural University of Medicine, Kyoto, Japan.] [Studies on the first intermediate host of *Paragonimus iloktsuenensis* Chen, 1940 in Japan. 1. Experimental infection with the larvae of *P. iloktsuenensis* to *Assiminea parasitologica* Kuroda, 1958 and *Assiminea japonica* von Martens, 1877.] *Japanese Journal of Parasitology*, 8 (5), 822–828. [In Japanese: English summary p. 828.]
Two species of snails, *Assiminea japonica* and *A. parasitologica* were experimentally infected with miracidia of *Paragonimus iloktsuenensis*. Rediae and cercariae were found in one out of 61 *A. japonica* (1.6%) and 17 out of 30 *A. parasitologica* (56.6%). The form and size of the rediae and cercariae obtained from these snails were similar to those of *P. ohirai*. Y. Yamao

Bionomics

- 344—AGOSIN, M. & ARAVENA, L., 1959. [Department of Parasitology, Biochemistry Section, University of Chile, Santiago, Chile.] "Studies on the metabolism of *Echinococcus granulosus*. III. Glycolysis, with special reference to hexokinases and related glycolytic enzymes." *Biochimica et Biophysica Acta*, 34 (1), 90–102.
Agosin & Aravena found that phosphorylative glycolysis of the Embden-Meyerhof scheme took place in cell-free extracts of scoleces of hydatid cysts. The characteristics of a number of the enzymes taking part in the process were examined. Hexokinases which specifically catalysed the phosphorylation of glucose, mannose, fructose and glucosamine were present. The extracts

catalysed the conversion of fructose 1-phosphate to fructose 6-phosphate and the conversion of glucosamine 6-phosphate to glucose 6-phosphate. These reactions were not studied in detail.

W. P. Rogers

- 345**—ANTONOVA, M. V., 1959. [Kafedra gigieni pitaniya, Kharkovski gosudarstvennii meditsinski institut, U.S.S.R.] [The survival of ascarid eggs in vegetable stores.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, **28** (6), 736. [In Russian.]

Antonova has studied the survival of *Ascaris* eggs in winter vegetable stores in which the temperature fluctuated from 0.5 °C. to 4.5 °C. and the relative humidity from 83% to 100%. She found that after 24 days 84% of the eggs were at the larval stage and after 80 days, 58%.

G. I. Pozniak

- 346**—CAMPBELL, J. W., 1960. [Department of Pathobiology, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland, U.S.A.] "Nitrogen and amino acid composition of three species of anoplocephalid cestodes: *Moniezia expansa*, *Thysanosoma actinioides*, and *Cittotaenia perplexa*." **Experimental Parasitology. New York**, **9** (1), 1–8.

Campbell measured total nitrogen, total non-protein nitrogen, non-protein carboxyl nitrogen, protein nitrogen and protein carboxyl nitrogen in *Moniezia expansa*, *Thysanosoma actinioides* and *Cittotaenia perplexa*. The percentage of the total nitrogen represented in each fraction was similar for each species, except the non-protein nitrogen fraction which varied somewhat. 19 amino-acids were common to the protein fractions from each species. The non-protein nitrogen fraction contained 17 to 22 amino-acids including β -alanine, β -aminoisobutyric acid and γ -aminobutyric acid. Amino-acids in sheep bile which were available to *T. actinioides* were also examined.

W. P. Rogers

- 347**—CAPRON, A. & BRYGOO, E. R., 1959. [Institut Pasteur de Madagascar et Laboratoire de Zoologie et de Parasitologie de la Faculté de Médecine et de Pharmacie de Lille, France.] "Sur la constitution des oeufs d'helminthes. I. Présence et formation d'une substance acido-alcool-résistante de la coque." **Bulletin de la Société de Pathologie Exotique**, **52** (5), 574–577.

Capron & Brygoo found that an acid-alcohol insoluble substance in the secretion of the vitelline glands of several cestodes and trematodes took part in the formation of the egg-shell. A similar substance was present in the uterus of *Enterobius vermicularis*.

W. P. Rogers

- 348**—CARBONELL, L. M. & APITZ, R. J., 1959. [Inst. Venezolano de Investigaciones Científicas, Ministerio de Sanidad y Asistencia Social, Caracas, Venezuela.] "Histochemical study of a pigment in the digestive tube of *Ascaris lumbricoides*." **Experimental Parasitology. New York**, **8** (6), 591–595.

Carbonell & Apitz have used histochemical and solubility tests to study a yellowish pigment in the cells of the gut of *Ascaris lumbricoides*. The pigment appeared to be "a lipid complex, and to exist in states of progressive oxidation". The pigment seemed to contain iron.

W. P. Rogers

- 349**—CAVENESS, F. E. & PANZER, J. D., 1960. [Dept. of Plant Pathology, South Dakota State College, Brookings, South Dakota, U.S.A.] "Nemic galvanotaxis." **Proceedings of the Helminthological Society of Washington**, **27** (1), 73–74.

An anode and a cathode were placed in agar and in soil and a current was passed through the medium. Plant-parasitic and free-living nematodes migrated to the cathode in both media. The threshold of response of *Panagrellus redivivus* was below 0.02 milliamps.

H. R. Wallace

- 350**—DINNIK, J. A. & DINNIK, N. N., 1959. [East African Veterinary Research Organization, Muguga, Kenya.] "Effect of the seasonal variations of temperature on the development of *Fasciola gigantica* eggs in the Kenya Highlands." **Bulletin of Epizootic Diseases of Africa**, **7** (4), 357–369. [French summary pp. 368–369.]

The paper gives the results of observations carried out to determine the effect of the great diurnal fluctuation of air temperature during the various seasons of the year on the development of *Fasciola gigantica* eggs at an altitude of 6,800 ft. in Kenya. The development of miracidia took 52 to 70 days in the warm and 109 days in the coldest season. The rate of mortality amongst the eggs varied from 10% in the warmest to 48% in the coldest season of the year. The eggs were found to be most susceptible to the unfavourable effect of low temperature at their early

stages of development. No miracidia hatched in the cold season when the diurnal fluctuation of the water temperature was between 5.5°C. and 19.5°C.. Miracidia which had delayed in the egg-shells up to 90 days were able to hatch and to infect snails when the eggs were placed at 26°C. No miracidia survived 105 days' delay in the egg-shells during the cold season of the year.

J. Dinnik

- 351—DUKE, B. O. L., 1960. [Helminthiasis Research Unit of the West African Council for Medical Research, Kumba, Southern Cameroons, U.U.K.A.] "Studies on loiasis in monkeys. II. The population dynamics of the microfilariae of *Loa* in experimentally infected drills (*Mandrillus leucophaeus*)." *Annals of Tropical Medicine and Parasitology*, 54 (1), 15-31.

Duke reports observations on the diurnal (human) and nocturnal (simian) strains of *Loa* in *Mandrillus leucophaeus* and records the fluctuations in the numbers of microfilariae during the course of primary infections, the influence of splenectomy on the microfilarial density and the effects of challenging infections of both strains of the worm. Evidence is given that, after their birth in the tissues, the microfilariae pass through the lymphatic system to the blood stream and that they accumulate in the blood vessels of the lungs throughout the course of the infection. The prepatent period for the diurnal strain is between 147 and 159 days and for the nocturnal strain is between 135 and 144 days. After their appearance in the peripheral blood, the microfilarial density rises over a period of 8 to 12 weeks, falls rapidly during the following three to six weeks and finally reaches a very low level which is described as the "suppressed" stage of the infection. During the suppressed stage, microfilariae could still be found in large numbers in the blood vessels of the lungs and the transplantation of mature worms from a host in the suppressed stage to an uninfected drill showed that the fecundity of the worms was not impaired. The suppression of the microfilariae in the peripheral blood did not occur when the spleen was removed; removal of the spleen during the suppressed stage caused an immediate rise in the numbers of microfilariae in the peripheral blood and removal of the spleen before the introduction of infective larvae led to infections which did not have a suppressed stage. The experiments with challenging infections indicated that, once the spleen had suppressed the primary infection, it maintained a large measure of suppression against challenging infections, even when the challenging strain differed from that of the primary infection. P. Williams

- 352—EDELSTEIN, I. A., 1959. [The action of acid and alkaline substances on intestinal chemoreceptors in *Ascaris* intoxication.] *Byulleten Eksperimentalnoi Biologii i Meditsiny*, 47 (5), 65-67. [In Russian: English summary p. 67.]

Edelstein studied the action of various solutions of acids and alkalis on the chemoreceptors before and after introduction of aqueous extract of *Ascaris suum* into the isolated intestinal loop of 47 cats. Those investigated were: acetic acid (0.5%), hydrochloric acid (N/100), lactic acid (1.5% to 2%), sodium di-acid phosphate (N/2), sodium bicarbonate (1.5% to 2%) and sodium mono-acid phosphate (N/2). The intestinal loop had been previously perfused with oxygenated Ringer-Locke solution. The results showed that the action of the tested compounds involved changes in the circulatory and respiratory reflexes in the presence of *Ascaris* extract. Thus pressor-depressor response, or the latter only, and often respiratory inhibition, were observed instead of the usual circulatory and respiratory reflexes. N. Jones

- 353—ENTNER, N., 1957. [Department of Preventive Medicine, New York University College of Medicine, New York, U.S.A.] "The occurrence of the pentose phosphate pathway in *Ascaris lumbricoides*." *Archives of Biochemistry*, 71 (1), 52-61.

Entner demonstrated a partial pentose phosphate pathway in extracts of muscle of *Ascaris lumbricoides*. Several of the enzymes were examined in detail and glucose 6-phosphate dehydrogenase and ribose 5-phosphate isomerase were partly purified. Transaldolase activity was not detected. Ribose 5-phosphate labelled with C¹⁴ at position 1 was metabolised and gave rise to ether-extractable acids. W. P. Rogers

- 354—FARR, M. M., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Survival of *Histomonas meleagridis* and eggs of five species of turkey nematodes outdoors on soil." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 41.

355—GOLDEN, A. M. & SHAFER, T., 1960. [Crops Research Division, U.S.D.A. Beltsville, Maryland, U.S.A.] "Survival of emerged larvae of the sugar-beet nematode (*Heterodera schachtii*) in water and in soil." *Nematologica*, 5 (1), 32–36. [German summary p. 36.]

Larvae of *Heterodera schachtii* kept in water at 24°C. showed hardly any loss of activity for two months, but after this the proportion of inactive larvae increased rapidly. All were inactive after seven months. Golden & Shafer repeated in a slightly modified form experiments by previous workers on survival of larvae of *Heterodera* in soil and conclude that after 12 months very few larvae survive in the absence of host roots. A. M. Shepherd

356—GUDZHABIDZE, G. S., 1959. [Gelmintologicheskii otdel, Institut meditsinskoi parazitologii i tropicheskoi meditsini imeni E.I. Matsinovskogo, Ministerstvo zdravookhraneniya, U.S.S.R.] [Treatment of sewage sediments by thermal fermentation.] *Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow*, 28 (5), 617–618. [In Russian.]

Thermophilic fermentation (minimum temperature 49°C.) of sewage sediments, which were changed every 24 hours, killed all helminth eggs (99% *Ascaris*) in the sediment. The eggs became deformed after at least two hours of fermentation. Mesophilic fermentation [10°C. to 40°C.], although detrimental to development, did not kill all the eggs. G. I. Pozniak

357—GUDZHABIDZE, S. I., 1959. [Gelmintologicheskii otdel, Institut meditsinskoi parazitologii i tropicheskoi meditsini, Ministerstvo zdravookhraneniya S.S.S.R.] [Experimental observations on the development and survival of *Ascaris lumbricoides* eggs in the soil of fields fertilized with sewage.] *Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow*, 28 (5), 578–583. [In Russian: English summary p. 583.]

In the Moscow region, the development of *Ascaris* eggs on fields irrigated by sewage starts at the end of May and is completed in July. Under favourable conditions, infective eggs can survive up to two-and-a-half years. Soil conditions detrimental to the eggs are low humidity of 3% to 4% and excessive daily temperature fluctuations. In the winter, eggs directly under the snow or up to 20 cm. deep in the soil where the temperature may reach –8°C. remain unaffected. G. I. Pozniak

358—GUDZHABIDZE, S. I. & LYUBCHENKO, S. D., 1959. [Parazitologicheskoe otdelenie, Gudauskaya obedinnennaya bolnitsa, U.S.S.R.] [Control of ascariasis and ancylostomiasis by composting of organic waste material.] *Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow*, 28 (5), 576–578. [In Russian: English summary p. 578.]

Solid and fluid excrements were mixed with garbage and were made into heaps of 2 m. by 10 m. by 1.5 m. and covered with soil or sawdust. Temperatures of 30°C. to 72°C. developed within the compost and lasted two to three months. By the time that composting was complete all the contained *Ascaris*, *Ancylostoma* and *Hymenolepis nana* eggs had become deformed. This method of excrement disposal, which is cheap and affords control of helminths, was particularly suited to the Gadausk region where sewerage is lacking. G. I. Pozniak

359—HEYNEMAN, D. & VOGEL, M., 1960. [Department of Zoology, University of California, Los Angeles, California, U.S.A.] "Succinic dehydrogenase activity in cysticercoids of *Hymenolepis* (Cestoda: Hymenolepididae) measured by the tetrazolium technique." *Experimental Parasitology. New York*, 9 (1), 14–17.

Heyneman & Vogel showed that histochemical tests for succinic dehydrogenase gave more intense staining reactions in cysticercoids of *Hymenolepis diminuta* and *H. nana* from host beetles kept at 37°C. than from beetles kept at 30°C. The high level of activity was maintained for 40 days after the host beetles were returned to 30°C. W. P. Rogers

360—HOPKINS, C. A., 1960. [Department of Zoology, The University, Glasgow, Scotland, U.K.] "Studies on cestode metabolism. VI. Analytical procedures and their application to *Hydatigera taeniaeformis*." *Experimental Parasitology. New York*, 9 (2), 159–166.

Hopkins analysed tissue from larval *Hydatigera taeniaeformis*. On a dry weight basis his results were: fat, 5.3%, nitrogen, 4.2%, glycogen, 43%, other sugars (anthrone estimation) 1.2%, ash 18.1%. Deoxyribonucleic acid was 20 mg. per 100 gm. fresh weight. The results obtained by the fractionation of nitrogen-containing material and carbohydrate with trichloroacetic acid and perchloric acid are also given. W. P. Rogers

- 361—JARRY, D., 1959. [Laboratoire de Parasitologie et d'Histoire Naturelle, Faculté de Médecine de Montpellier, Hérault, France.] "Note préliminaire sur les hirudinées de la source du Lez." **Vie et Milieu. Paris**, 10 (3), 267–279.

Jarry briefly describes the physiography and general floral assemblies of the head of the River Lez of the Montpellier area and, from collections, demonstrates that *Erpobdella octoculata* and *Glossiphonia complanata* are eurybiotic, in contrast to *Hemiclepsis marginata*, *Theromyzon tessulatum*, *Haementeria costata*, and *Piscicola geometra* which are stenobiotic and less frequently collected. The species are characterized and discussed in relation to their habitats.

L. R. Richardson

- 362—KAIPAINEN, W. J. & OHELA, K., 1959. [Second Medical Clinic, University of Helsinki, Finland.] "Effect of tapeworm extract on vitamin B₁₂ bound to gastric juice." **Annales Medicinæ Internæ Fenniae**, 48 (2), 77–80.

Extracts of tapeworm [presumably *Diphyllobothrium latum*] hydrolysed the non-dialysable complex of human gastric juice and radio-active vitamin B₁₂ and freed the radio-active moiety which was dialysable.

W. P. Rogers

- 363—KATZ, F. F., 1960. [Department of Parasitology, University of Pennsylvania, Philadelphia, U.S.A.] "The effect of irradiation on reproduction by the heterogenetic generation of *Strongyloides papillosus*. I. Irradiation of males and females." **Journal of Parasitology**, 46 (3), 383–391.

Exposure of fourth and fifth-stage male and third and fourth-stage female larvae of *Strongyloides papillosus* was made to varying doses of Cobalt 60 gamma irradiation. These larvae were cultured *in vitro* with controls of the opposite sex to determine the effect of irradiation on the number of offspring produced. Fewer offspring were produced from cultures containing irradiated males than those containing irradiated females. Examination of the linear relationship between the dose of irradiation and the effect on the larvae production showed that larvae occurred where males had been irradiated at 42 Kr and where females had received 50 Kr but no larvae occurred at higher levels. When the dose of irradiation was increased there was a decrease in the percentage number of eggs hatching. The dominant lethal effect was observed with males exposed to 20 Kr and higher doses and with females at 40 Kr and higher.

K. Heath

- 364—KOBAYASHI, A. ET AL., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [The resistance of hookworm eggs to lower temperatures.] **Japanese Journal of Parasitology**, 8 (4), 637–641. [In Japanese: English summary p. 641.]

About 50% of *Ancylostoma duodenale* eggs tested were killed when they were kept at 5°C. for 30 hours but 30% to 40% of them were still alive after 72 to 96 hours. With *Necator americanus* the survival rate of the eggs was 40% after three hours but almost nil after 30 hours. At 0°C., about 50% of *A. duodenale* eggs died in 24 hours, and their survival rate after 72 hours was less than 30%, while the *N. americanus* eggs showed a survival rate of 13.8% after three hours and almost nil after 24 hours. At –5°C., 58.9% of *A. duodenale* eggs survived after three hours, and none after nine hours, while 7.2% of the *N. americanus* eggs survived after three hours, and none after nine hours. In short, the eggs of *A. duodenale* were more resistant to cold than those of *N. americanus*.

Y. Yamao

- 365—KRUEGER, R. F., 1959. [Michigan State University, U.S.A.] "An investigation of the metabolism of the nematode, *Syngamus trachea* (Montagu, 1811) Chapin, 1925." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 36–37.

- 366—KRUEGER, R. F., 1959. [Michigan State University, U.S.A.] "Studies on the pseudocoelomic fluid of the nematode, *Syngamus trachea* (Montagu, 1811) Chapin, 1925." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 38.

- 367—KRUEGER, R. F., 1960. [Michigan State University, U.S.A.] "Biological and biochemical investigations on the nematode, *Syngamus trachea* (Montagu, 1811) Chapin, 1925." **Dissertation Abstracts**, 20 (9), 3901–3902.

- 368**—KRVAVICA, S., MARTINČIĆ, T. & ASAJ, R., 1959. [Zavod za patološku fiziologiju Veterinarskog fakulteta Sveučilišta u Zagrebu, Yugoslavia.] "Metabolizam aminokiselina kod nekih parazita. I. Resorpcija i izlučivanje aminokiselina kod trakavice *Anoplocephala magna*." **Veterinarski Arhiv**, **29** (11/12), 305–313. [English & French summaries pp. 311–313.]

Krvavica *et al.* have studied the metabolism of amino-acids in *Anoplocephala magna* obtained from freshly slaughtered horses. The tapeworms were immersed in a basic medium consisting of Ringer's solution and 1% glucose, alone, or with the addition of alanine or alpha-ketoglutaric acid. The results of the experiments, the evaluation of which is based on the findings of Aldrich *et al.* [for abstract see Helm. Abs., **23**, No. 261] showed that: (i) more glutamic acid was excreted in the presence of alanine and alpha-ketoglutaric acid than if alanine alone was added; (ii) the quantity of alanine was markedly reduced as a result of two hours immersion of the tapeworm in the medium (with both substances added); (iii) the following amino-acids were found to be excreted by the tapeworm in a larger quantity: serine, glycine, alanine, beta-alanine, lysine, valine and tyrosine. The chromatogram also indicated the presence of some other substances; (iv) the addition of threonine, leucine, isoleucine and phenylalanine caused greater excretion of the above amino-acids than the addition of tryptophane. The free amino-acids of the tapeworm and those in the hydrolysate of its proteins were also determined and it is mentioned that temperature affects resorption and excretion of amino-acids by *A. magna*. Thus at 4°C. glutamic acid did not appear whereas at 37°C. it was present in large amounts.

N. Jones

- 369**—KRVAVICA, S., MARTINČIĆ, T. & ASAJ, R., 1959. [Zavod za patološku fiziologiju Veterinarskog fakulteta Sveučilišta u Zagrebu, Yugoslavia.] "Metabolizam aminokiselina kod nekih parazita. II. Aminokiseline u hidatidnoj tekućini i germinativnom epitelu ehinokoka." **Veterinarski Arhiv**, **29** (11/12), 314–321. [English & French summaries pp. 320–321.]

Krvavica *et al.* carried out biochemical studies of hydatid cysts from the livers of 36 pigs and found that: (i) the hydatid fluid contains on an average 2.5 times as much alpha-amino nitrogen as pig serum; (ii) glycine, alanine, valine, methionine, tryptophan, leucine, isoleucine and phenylalanine are present in the fluid in appreciably greater quantities than other amino-acids; (iii) the presence of beta-alanine was frequently observed in the hydatid fluid of sterile cysts; (iv) the presence of aspartic acid, glutamic acid, serine, glycine, glucosamine, threonine, alanine, valine, proline, methionine, leucine, isoleucine and phenylalanine has been proved in the hydrolysate of fertile and sterile germinal layers, whereas arginine was found only in the hydrolysate of the latter. The authors conclude that the hydatid fluid is not merely an ultrafiltrate of tissue fluids, but is the result of selective activity of the germinal epithelium. The paper is illustrated with reproductions of chromatograms.

N. Jones

- 370**—LEVINE, N. D., 1959. [College of Veterinary Medicine, University of Illinois, Urbana, U.S.A.] "The relation of climate to the epidemiology of gastrointestinal nematodes of sheep and cattle." [Abstract.] **Journal of Parasitology**, **45** (4, Sect. 2), 59–60.

- 371**—LUCKER, J. T., 1960. [Animal Disease and Parasite Research Division, Agricultural Research Service, Beltsville, Maryland, U.S.A.] "A test of the resistance of *Taenia saginata* eggs to freezing." **Journal of Parasitology**, **46** (3), 304.

Batches of *Taenia saginata* eggs were stored in saline in the refrigerator at a mean temperature of 24°F. (–4.5°C.) and then fed to cattle. Examination of the cattle on slaughter showed that the eggs survived at this temperature in large numbers for 12 days but only a few survived for 76 days.

L. K. Whitten

- 372**—MANDLOWITZ, S., DUSANIC, D. & LEWERT, R. M., 1960. [Department of Microbiology, University of Chicago, Chicago 37, Illinois, U.S.A.] "Peptidase and lipase activity of extracts of *Schistosoma mansoni* cercariae." **Journal of Parasitology**, **46** (1), 89–90.

Mandlowitz *et al.* found that extracts of cercariae of *Schistosoma mansoni* contained peptidase and lipase. Extracts of filariform larvae of *Strongyloides ratti* and *Nippostrongylus muris* also contained lipase.

W. P. Rogers

- 373—MANSOUR, T. E., 1959.** [Department of Pharmacology, Louisiana State University, School of Medicine, New Orleans, Louisiana, U.S.A.] "Studies on the carbohydrate metabolism of the liver fluke *Fasciola hepatica*." *Biochimica et Biophysica Acta*, **34** (2), 456–464.

Mansour found that glycogen in *Fasciola hepatica* decreased by 84μ moles to 97μ moles (as glucose) per gm. wet weight in six hours under anaerobic conditions in glucose-free medium. Propionic and acetic acids in the ratio of about 3:1 were the chief excretory products; only 4% to 9% was lactic acid. Glucose in the medium was used at the rate of 110μ moles to 180μ moles per gm. wet weight per six hours. This was not affected by ligaturing the mouth of the parasite; nor was the rate of excretion. Oxygen had little effect on the use of carbohydrates by the worms or on their excretory products. The oxygen uptake was about 35μ moles to 43μ moles per gm. wet weight per three hours and the R.Q. varied from 1.7 to 2.2. These results were only slightly changed when glucose was present in the medium. W. P. Rogers

- 374—MANSOUR, T. E., 1959.** [Department of Pharmacology, Louisiana State University, School of Medicine, New Orleans, Louisiana, U.S.A.] "The effect of serotonin and related compounds on the carbohydrate metabolism of the liver fluke, *Fasciola hepatica*." *Journal of Pharmacology and Experimental Therapeutics*, **126** (3), 212–216.

Mansour incubated *Fasciola hepatica* under anaerobic conditions in a salt medium containing cattle blood serum and glucose. The major products of carbohydrate metabolism were propionic and acetic acids; less than 10% of the carbohydrate used appeared as lactic acid. Stimulation of the movement of worms with serotonin ($5 \times 10^{-4}\text{M}$) or lysergic acid diethylamide ($1 \times 10^{-6}\text{M}$) led to an increase in the use of carbohydrate and an increase in lactic acid production up to tenfold. The quantity and proportion (3:1) of propionic and lactic acid produced was not changed. Bromolysergic acid diethylamide which inhibited the stimulatory effect of lysergic acid diethylamide on movement also inhibited the increase in lactic acid production but it only partly inhibited the increase in glucose uptake. Epinephrine ($1 \times 10^{-3}\text{M}$) did not have a significant effect on the carbohydrate metabolism of the flukes. W. P. Rogers

- 375—MORI, S., 1957.** [Department of Public Health, Faculty of Medicine, Tottori University, Yonago, Japan.] [Ecological study on *Ascaris* eggs. I. The influences of temperature and humidity on the development of *Ascaris* eggs.] *Journal of the Yonago Medical Association*, **8** (1), 13–33. [In Japanese.]

Human ascarid eggs developed into larvae provided that the humidity was adequate. The hatching rate did not depend on temperature when its range remained between 20°C. and 34°C. At 20°C. development of larvae was possible between 80% and 100% relative humidity, and at 30°C. between 90% and 100%. Below this humidity the development of larvae never reached beyond a certain stage, depending on humidity, and eventually they died. The speed of larval development was influenced mostly by temperature. Under adequate humidity it took 28 days at 20°C. and 13 days at 30°C. for larvae to develop. Humidity also had some influence on the speed of the development. Y. Yamao

- 376—MORI, S., 1957.** [Department of Public Health, Tottori University, Yonago, Japan.] [Ecological study on *Ascaris* eggs. II. The resistance of *Ascaris* eggs to temperature and humidity.] *Journal of the Yonago Medical Association*, **8** (1), 34–56. [In Japanese.]

Human ascarid eggs lived longer when the temperature was low and the humidity high. The effect of humidity was influenced by temperature. At high temperatures with low humidity eggs died quickly. No difference in resistance to temperature and humidity was noted between human and pig ascarid eggs. Y. Yamao

- 377—MORI, S., 1957.** [Department of Public Health, Faculty of Medicine, Tottori University, Yonago, Japan.] [Ecological Study on *Ascaris* eggs. III. Experiments on *Ascaris* eggs exposed intermittently to moist and dry conditions for a definite period.] *Journal of the Yonago Medical Association*, **8** (1), 57–66. [In Japanese.]

The effect of intermittent drying on *Ascaris* eggs was determined by the duration of drying, degree of dryness and temperature. Y. Yamao

378—MYERS, R. F., 1960. [Crops Research Division, U.S.D.A., Beltsville, Maryland, U.S.A.] "The sensitivity of some plant-parasitic and free-living nematodes to gamma and X-irradiation." *Nematologica*, **5** (1), 56–63. [German summary pp. 62–63.]

The influence of gamma and X-irradiation on the sterilization of 14 species of free-living and plant-parasitic nematodes is reported. The doses required to give complete sterilization were never less than 20,000 r. Doses causing death, temporary sterilization, embryo destruction, altered movement, variation in length and other morphological changes are described for one or more species.

H. R. Wallace

379—NISHIMURA, T., 1959. [Department of Parasitology, Research Institute for Microbial Diseases, Osaka University, Osaka, Japan.] [Studies on the tissue-invading habit of hookworm larvae in various temperatures. 3. Behaviour of larval *Ancylostoma caninum* against the tissue with the serum of the normal host within the water.] *Japanese Journal of Parasitology*, **8** (4), 610–615. [In Japanese: English summary p. 615.]

Ancylostoma caninum larvae penetrated more easily into the tissue of washed rabbit intestine when it contained dog serum than when it contained human serum. Positive larval chemotaxis to the serum was more obvious at body temperature than at lower temperatures. Compared with the tissue-penetrating power of the larvae of *A. duodenale* into human serum, the penetration of *A. caninum* into human serum was low at different temperatures except 18°C. The kinetic potency of the *A. caninum* larvae to penetrate into tissue seemed to be most active at 24°C. The suitable temperature for movement of these larvae appeared to be relatively low compared with that for *A. duodenale*.

Y. Yamao

380—NYBERG, W., 1958. [Vasa Central Hospital, Vasa, Finland.] "Absorption and excretion of vitamin B₁₂ in subjects infected with *Diphyllobothrium latum* and in non-infected subjects following oral administration of radioactive B₁₂." *Acta Haematologica*, **19** (2), 90–98.

Nyberg investigated the distribution of radio-active (cobalt-60 labelled) vitamin B₁₂ between *Diphyllobothrium latum* and its host in worm carriers with and without anaemia and the absorption of the labelled vitamin from the intestine in normal subjects and *D. latum* carriers. He found that (i) in anaemic subjects the uptake of B₁₂ by the worm was greater than in non-anaemic subjects; (ii) normal subjects usually absorbed more (55%) B₁₂ than the non-anaemic tapeworm carriers; (iii) radio-activity measured in the faeces was about three times higher in normal subjects than in non-anaemic worm carriers; and (iv) the radio-activity measured in tapeworms expelled from carriers without anaemia was about 180% higher than radio-activity in the faeces. From these results it is concluded that infection with *D. latum* always affects the capacity of the host to absorb ingested B₁₂.

J. M. Watson

381—OBA, N., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Gnathostoma spinigerum*. 1. Studies on the respiratory metabolism of larval and adult *Gnathostoma spinigerum* Owen.] *Journal of the Kurume Medical Association*, **22** (8), 2998–3005. [In Japanese: English summary p. 3005.]

The oxygen consumption of larval *Gnathostoma spinigerum* freshly removed from *Ophicephalus argus* was 2.7 μ l. per hour per milligramme of dry weight in sterile physiological saline solution, and 2.9 μ l. in Ringer's solution with 0.5% glucose. The oxygen consumption of adult worms of *G. spinigerum* from the stomach of a cat was 3.4 μ l. in the male and 7.9 μ l. in the female per hour per milligramme of dry weight, in physiological saline solution at 37°C. The rate of oxygen consumption remained constant for the first two hours and then began to decline slowly.

Y. Yamao

382—OKYOB, L., 1959. [Department of Parasitology, Research Institute for Microbial Diseases, Osaka University, Osaka, Japan.] [The behaviour of *Ascaris lumbricoides* from swine in a glass tube under the influence of the various values of pH.] *Japanese Journal of Parasitology*, **8** (5), 740–744. [In Japanese: English summary p. 744.]

Okyob observed the reactions of pig ascarids in a glass tube at various hydrogen ion concentrations. The behaviour of ascarids under pH values ranging from nearly three to about eight, were generally the same. But under pH 2 the ascarids showed a remarkably wavy motion, a forward movement and a fierce tangled movement, and with pH 10 the body movement

was the same as in pH 2 but was less intense. The wavy motion of the ascarid and its forward movement did not seem to be normal and only appeared under such abnormal conditions as observed in the glass tube experiment. Y. Yamao

383—PARKER, J. C. & HALEY, A. J., 1960. [Zoology Department, University of Maryland, College Park, Maryland, U.S.A.] "Phototactic and thermotactic responses of the filariform larvae of the rat nematode *Nippostrongylus muris*." **Experimental Parasitology**, New York, 9 (2), 92-97.

The authors exposed filariform larvae of *Nippostrongylus muris* on clear agar plates to a light intensity of 1,600 foot candles and showed that within one-and-a-half hours about 92% of the larvae had moved into the test area as compared with 3.9% of unstimulated larvae. When the light stimulus was cooled by passage through water only 2.1% reached the test area. Measurement of the temperature variation in the agar showed that with warm light over a distance of 4 cm. from the centre of the stimulus the variation was 3.7°C. whereas with cooled light it was 0.7°C. When the small amount of heat present in the cooled light was concentrated by blackening the agar with charcoal 81.2% of the larvae migrated into the centre of the stimulated area where the temperature was 1.8°C. higher than the distance 4 cm. away. It was concluded that the positive larval response to light can be explained by the heat produced by the light source. K. Heath

384—PHIFER, K., 1960. [Marine Biological Laboratory, Woods Hole, Massachusetts, U.S.A.] "Permeation and membrane transport in animal parasites: the absorption of glucose by *Hymenolepis diminuta*." **Journal of Parasitology**, 46 (1), 51-62.

Phifer studied the absorption of glucose by *Hymenolepis diminuta* in short (one minute) and long (30 minute) experiments. The results were generally similar. The rate of uptake was independent of concentration above $1.1 \times 10^{-3}M$; the apparent Michaelis constant was $1.5 \times 10^{-3}M$ (short experiments) or $1.6 \times 10^{-3}M$ (long experiments). The Q_{10} varied from 2.4 to 3.2 from 17°C. to 37°C. (short experiments). The pH did not affect absorption of glucose in short experiments; in long experiments an optimum occurred at pH 7.5. Dinitrophenol, phlorizin and para-chloromercuribenzoate reduced the uptake of glucose. These results suggest permeation took place by processes other than simple diffusion. The rate of glucose absorption in worms taken from the host 12 days after infection was greater than in younger or older worms. The size of the worms had no effect on the rate of uptake. W. P. Rogers

385—POLLAK, J. K., 1957. "Chemical differences between the ovaries of *Ascaris lumbricoides* obtained from two geographical locations." **Australian Journal of Science**, 20 (1), 23-24.

Pollak showed that ovaries of *Ascaris lumbricoides* collected from pigs in Sydney had a significantly lower wet weight than ovaries from the parasites which were collected in Montreal. Non-protein nitrogen, free α -amino nitrogen and free ammonia nitrogen were all present in higher concentrations in ovaries of worms collected in Sydney. Differences were also noted in the concentration of other nitrogenous substances. W. P. Rogers

386—READ, C. P., SIMMONS, Jr., J. E. & ROTHMAN, A. H., 1960. [Marine Biological Laboratory, Woods Hole, Massachusetts, U.S.A.] "Permeation and membrane transport in animal parasites: amino acid permeation into tapeworms from elasmobranchs." **Journal of Parasitology**, 46 (1), 33-41.

Read *et al.* found that the entry of uniformly C^{14} -labelled L-valine and L-leucine into *Calliobothrium verticillatum* involved catalytic processes for which the Michaelis constants were $2 \times 10^{-3}M$ and $1 \times 10^{-3}M$ respectively at 10°C. and pH 7.2. Other details of the kinetics of the processes are given. The permeation of L-valine was competitively inhibited by L-leucine and the permeation of L-leucine was competitively inhibited by L-valine. Other amino-acids, notably DL-methionine and L-cysteine also inhibited, but the nature of the inhibition was not examined. If the worms were incubated with iodoacetate or dinitrophenol for 15 minutes, permeation of L-leucine was inhibited. The addition of glucose to the medium did not affect permeation with L-valine or L-leucine. The pH optimum for the entry of L-leucine was 7.4. W. P. Rogers

- 387—ROGERS, W. P., 1960. [Department of Zoology, University of Adelaide, South Australia.] "The physiology of infective processes of nematode parasites; the stimulus from the animal host." **Proceedings of the Royal Society. Series B**, 152 (948), 367–386.

Rogers found that the stimulus from the warm-blooded host necessary for the hatching of infective eggs of several species of ascarids and for the exsheathment of infective larvae of several species of trichostrongylids was chiefly dependent upon the concentration of undissociated carbonic acid or dissolved gaseous carbon dioxide. The oxidation-reduction potential and the hydrogen ion concentration affected the activity of the stimulus; the concentration of salts, bile salts and several other substances affected the stimulus to a lesser extent. The pattern of these components of the stimulus varied for different species and was related to the site of infection in the host and also to the specificity of the parasite.

W. P. Rogers

- 388—ROHRBACHER, Jr., G. H., 1960. [Regional Animal Disease Research Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Auburn, Alabama, U.S.A.] "The effect of stilbestrol implants upon multiple infections of *Trichostrongylus axei* and *Trichostrongylus colubrifomis* in the laboratory rabbit." **Journal of Parasitology**, 46 (1), 108.

Rohrbacher found that implants of 12 mg. of stilboestrol in grade California rabbits of either sex had no effect on infections with *Trichostrongylus axei* or *T. colubrifomis*.

W. P. Rogers

- 389—SAITO, I., 1959. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [Development of *Ascaris* eggs discharged from febrile patients.] **Igaku Kenkyu. Fukuoka**, 29 (2), 327–339. [In Japanese: English summary p. 339.]

The development of human *Ascaris* eggs was inhibited when they were kept at 38°C. for seven days, 39°C. for five days, 40°C. for four to five days and 41°C. for three to four days. Within the limit of human body temperature during pyrexia, an inhibitory effect on the development of the eggs was not observed. When the eggs were exposed to a high fever longer than a certain length of time, the higher the temperature the shorter the time required to produce an inhibiting effect on them. Accordingly, *Ascaris* eggs obtained from the faeces of febrile patients were investigated. The eggs which had not remained long in the intestine (dysentery) showed a normal development while those which had stayed longer in the intestine (encephalitis japonica) showed no larval development.

Y. Yamao

- 390—SAITO, I., 1959. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [Do *Ascaris* larvae pass through filter bed of water supply?] **Igaku Kenkyu. Fukuoka**, 29 (2), 340–344. [In Japanese: English summary p. 344.]

When water containing *Ascaris* eggs was experimentally filtered through a bed of fine sand (0.87 mm.) the eggs were found about 50 cm. below the surface and free larvae down to a depth of 80 cm. When a sand filter with a composition similar to that of a filtering sand bed of a city water supply was used, very few of the larvae passed through a sand bed 100 cm. thick. This indicated that there was a possibility of *Ascaris* eggs passing through the filter although this might have no practical significance.

Y. Yamao

- 391—SAZ, H. J. & VIDRINE, Jr., A., 1959. [Department of Pharmacology, School of Medicine, Louisiana State University, New Orleans, Louisiana, U.S.A.] "The mechanism of formation of succinate and propionate by *Ascaris lumbricoides* muscle." **Journal of Biological Chemistry**, 234 (8), 2001–2005.

Saz & Vidrine used C¹⁴-labelled glucose, lactate and carbon dioxide to study the synthesis of succinate in isolated muscle strips of *Ascaris lumbricoides*. The results showed that synthesis took place anaerobically via the Emden-Meyerhoff glycolytic reaction sequence and was followed by fixation of carbon dioxide into pyruvate and reduction to succinate. Malonate strongly inhibited the incorporation of lactate into succinate. Succinate was decarboxylated directly to propionate and carbon dioxide; the reaction was not inhibited by malonate. Carbon dioxide fixation into propionate to form succinate also took place. The authors suggest that succinate may be the precursor of α -methylbutyrate and other volatile fatty acids as well as propionate.

W. P. Rogers

- 392—SCHREIBER, K. & SEMBDNER, G., 1960. [Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Mühlhausen i. Thür, Thälmannstrasse 28, Germany.] "Über die spezifische Wirkung einiger Solanaceen-Alkaloide auf den Kartoffelnematoden, *Heterodera rostochiensis* Woll." *Planta Medica*, Stuttgart, 8 (1), 107-113.

Inhibition of hatching of *Heterodera rostochiensis* was observed in some root diffusates from solanaceous plants. Schreiber & Sembdner show that nicotine, atropine and tropine, which are derived from solanaceous plants, are toxic to potato-root eelworm. H. R. Wallace

- 393—SIMMONS, Jr., J. E., READ, C. P. & ROTHMAN, A. H., 1960. [Marine Biological Laboratory, Woods Hole, Massachusetts, U.S.A.] "Permeation and membrane transport in animal parasites; permeation of urea into cestodes from elasmobranchs." *Journal of Parasitology*, 46 (1), 43-48, 49-50.

Simmons *et al.* found that the entry of C^{14} -urea into *Calliobothrium verticillatum* showed the following characteristics: the rate of entry decreased with time and the internal and external concentrations reached an equilibrium after 60 to 90 minutes; the rate of entry was directly proportional to the concentration of the external environment; the rate of leakage from the worm was similar to the rate of entry; changes in pH or the addition of glucose to the medium did not affect the rate of entry; Q_{10} values varied from 1.4 to 1.5 from 0°C. to 21°C. These results indicate that the permeation of urea into the worm was by simple diffusion.

W. P. Rogers

- 394—SOULSBY, E. J. L. & COOMBS, R. R. A., 1959. [Department of Animal Pathology, University of Cambridge, U.K.] "Studies on blood group substances associated with *Ascaris lumbricoides*." *Parasitology*, 49 (3/4), 505-510.

Soulsby & Coombs found that extracts from adult *Ascaris lumbricoides* collected from blood group O and blood group A pigs neutralized pig anti-A and human anti-A and anti-B agglutinins. A-substance was produced by *Ascaris* larvae. The possession of a specific blood group in pigs did not prevent infection. A-antibody levels in pigs rose following infection with *A. lumbricoides* but infection with *Oesophagostomum dentatum* had no such effect.

W. P. Rogers

- 395—TAKAHASHI, T., 1959. [Department of Biology, Showa Medical School, Tokyo, Japan.] [Studies on *Diphyllbothrium mansonii*. 2. Histochemical studies on plerocercoid.] *Japanese Journal of Parasitology*, 8 (5), 669-676. [In Japanese: English summary p. 673.]

Through histochemical studies, abundant glycogen was found in the subcuticular cells and parenchyma of the plerocercoid larvae of *Diphyllbothrium mansonii*; other polysaccharides occurred in the cuticle and muscle fibres; nucleic acid was found in the subcuticular cells and parenchyma. Both alkaline and acid phosphatases were detected in greater quantities in the cuticle and subcuticular cells than in any other parts of the larvae. When the plerocercoid larvae developed into young tapeworms in the intestine of the final host, the change in the histochemical distribution of these substances was observed.

Y. Yamao

- 396—THOMPSON, M. J., MOSETTIG, E. & VON BRAND, T., 1960. [Laboratory of Chemistry, National Institutes of Health, Bethesda, Maryland, U.S.A.] "Unsaponifiable lipids of *Taenia taeniaeformis* and *Moniezia* sp." *Experimental Parasitology*, New York, 9 (2), 127-130.

Thompson *et al.* found that cholesterol formed 98% and 85% of the unsaponifiable material from *Taenia taeniaeformis* and *Moniezia* sp. respectively. Friedelin was not found. 7-ketocholesterol which was formed during the isolation and storage of the unsaponifiable material, was obtained from *Moniezia*, but was absent from unsaponifiable material from *T. taeniaeformis*.

W. P. Rogers

- 397—TSUDA, M., 1959. [Department of Parasitology, School of Medicine, Chiba University, Chiba, Japan.] [Biological studies on *Paragonimus westermani*. 2. The resistance of the metacercariae of *Paragonimus westermani*.] *Japanese Journal of Parasitology*, 8 (5), 812-821. [In Japanese: English summary p. 821.]

Metacercariae of *Paragonimus westermani* were rapidly killed by temperatures of 50°C. and over, but survived for a long period at 0°C. to 2°C. In both 0.85% sodium chloride and 0.5% sodium bicarbonate solution, the metacercariae could survive for a long time (60 days in

the former and more than 30 days in the latter). Anti-metacercarial activity of the disinfectants tested increased in the following order: phenol; cresol; mercury bichloride. Metacercariae were killed by 0.2% hydrochloric acid within 24 hours and by 3% to 5% sodium hypochlorite within two hours. The response of metacercariae to a given agent was variable under the same external conditions. This variance was presumably due to the difference in maturity of the metacercariae.

Y. Yamao

- 398—URABE, K., 1958. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [Difference of resistance against heating between *Ascaris* eggs in faeces and uterus.] *Igaku Kenkyu. Fukuoka*, 28 (3), 630-651. [In Japanese: English summary p. 651.]

The resistance of the eggs obtained from the uterus of *Ascaris lumbricoides* to heating at 50°C. for 10 to 30 minutes was markedly less than that of eggs collected from the faeces. The weak resistance of the uterine eggs was not due to the absence of faecal matter but appeared to be due to prematurity; eggs discharged from females in culture fluid were more resistant to heat than eggs extracted from the uterus.

Y. Yamao

- 399—VERNBERG, W. B. & HUNTER, W. S., 1960. [Duke University, Durham and Duke University Marine Laboratory, Beaufort, North Carolina, U.S.A.] "Studies on oxygen consumption in digenetic trematodes. IV. Oxidative pathways in the trematode *Gynaecotyla adunca* (Linton, 1905)." *Experimental Parasitology*, New York, 9 (1), 42-46.

Vernberg & Hunter found that some intermediates of the Krebs tricarboxylic acid cycle stimulated the respiration of whole *Gynaecotyla adunca*, especially as the age of the worms increased. Malonate, diethyldithiocarbamate, salicylaldehyde, and phenylthiourea inhibited respiration.

W. P. Rogers

- 400—VILAR-ALVAREZ, C. M., 1960. [Emory University, U.S.A.] "The biology and chemical analysis of the tapeworm *Hymenolepis diminuta* in surgically-altered rats." *Dissertation Abstracts*, 20 (8), 3448-3449.

- 401—VOGE, M., 1960. [Department of Infectious Diseases, School of Medicine, University of California, Los Angeles, California, U.S.A.] "Fat distribution in cysticercoids of the cestode *Hymenolepis diminuta*." *Proceedings of the Helminthological Society of Washington*, 27 (1), 1-4.

Voge found that lipids in cysticercoids of *Hymenolepis diminuta* which stained with Sudan Black and Sudan IV were concentrated mainly in the peripheral tissue layer, the wall of the cysticercoid cavity, the cavity proper, and the scolex. Positive histochemical reactions for a cerebroside and cholesterol were also obtained in different parts of the larvae.

W. P. Rogers

- 402—WALLACE, H. R., 1960. [Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, U.K.] "Movement of eelworms. VI. The influence of soil type, moisture gradients and host plant roots on the migration of the potato-root eelworm *Heterodera rostochiensis* Wollenweber." *Annals of Applied Biology*, 48 (1), 107-120.

The optimum crumb sizes for movement of potato-root eelworm larvae in a sandy loam, a heavy clay and a peat soil were 150-250 μ and 250-400 μ . Mobility was similar in clay and sandy loam but in peat the larvae were able to move at much lower moisture contents. Larvae moved to the wet end of a moisture gradient in sand, but there was no response to the gradient when the width of the pores in the sand approximated to the diameter of the larva. Observations on larvae newly emerged from cysts, in the presence of host plants, showed that the larvae orientated themselves at a distance from the root and did not reach the root by random movement. Wallace suggests that eelworm movement is explicable by considering the relationship between pore size, eelworm diameter and water distribution.

H. R. Wallace

- 403—YASUDA, I., 1957. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [The effect of various chemicals on the larvae of the hookworm. 3. Chemical control of the larvae of the canine hookworms in the soil.] *Japanese Journal of Parasitology*, 6 (6), 509-514. [In Japanese: English summary p. 514.]

About 1,000 infective larvae of canine hookworms were pipetted into either moist soil (100 gm.) or sand (200 gm.), in glass bowls (12 cm. diameter) and mixed with the substrate. After

24 hours, each of ten solutions of chemicals, the amount of the solution ranging from 5 c.c. to 20 c.c., was evenly sprayed on the surface and left untouched for the following 24 hours. Nematocide alone, in similar amounts, was pipetted into the soil or sand. Then the larvae were separated by a modified Baermann apparatus. Among the 11 chemicals tested, folidol, mustard oil and Nematocide were most effective. 1.0% aqueous solution of borax did not kill the larvae within 24 hours. Other chemicals were found to be ineffective, unless larger amounts of concentrated solutions were sprayed. Y. Yamao

- 404—YOKOO, T. & MATSUNOBU, K., 1957. [Faculty of Agriculture, Saga University, Saga, Japan.] [On the thermal death point of the potato tuber lesion nematode (*Pratylenchus pratensis*).] **Agricultural Bulletin. Saga University**, No. 5, pp. 97–102. [In Japanese: English summary pp. 97–98.] Yokoo & Matsunobu tested the thermal death point of the root lesion nematode, *Pratylenchus pratensis* [tentative identification], by immersing the nematode in water at the temperature to be tested and then inoculating the larvae into nematode-free wheat to test their ability to invade the root. The thermal death point was found to be 80 minutes immersion at 45°C., 30 minutes at 50°C., 10 minutes at 55°C., and five minutes at 60°C. The authors therefore suggest that immersion of the nematode-infected potato tubers in water at 50°C. for 30 minutes would be sufficient to control the root lesion nematodes. M. Ichinohe

- 405—ZEIN-ELDIN, E. A. & SCOTT, J. A., 1959. [University of Texas Medical Branch, Galveston, U.S.A.] "Free amino acid content of the blood of natural and experimental hosts of the filarial worm *Litomosoides carinii*." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 38.

Pathogenesis

- 406—ALLEN, R. W., SAMSON, K. S. & SCHAD, G. A., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, State College, New Mexico, U.S.A.] "Cross-transmission of *Haemonchus* from the pronghorn antelope to domestic sheep, with observations on the pathogenicity of this strain in lambs as compared with that of *Haemonchus* from domestic sheep." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 47.

- 407—ASAMOTO, A., 1959. [The Second Surgical Department, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [A histopathological investigation of a cirrhotic liver in schistosomiasis japonica.] **Igaku Kenkyu. Fukuoka**, 29 (2), 624–646. [In Japanese: English summary pp. 645–646.]

Liver cirrhosis in schistosomiasis japonica could be divided into three types: periportal fibrotic, intermediate, and pseudo-lobular, with so-called pseudo-lobule formation in the liver, according to the proliferation of connective tissue in the liver. These cirrhotic types were, in general, correlated with the time which had elapsed after infection with *Schistosoma japonicum* and with the number of eggs in the liver. Glisson's sheaths or septa composed of connective tissue became thick because of the eggs in them. No collateral channel was formed between the portal vein and the hepatic vein. Asamoto stated that repeated infections played an important role in the development of cirrhosis in schistosomiasis, that portal hypertension in this disease should be diagnosed at the earliest possible stage, and that relatively simple surgical procedure was highly to be recommended in the subsequent treatment of the condition. Y. Yamao

- 408—ASKERKHANOV, R. P., 1959. [Klinika fakultetskoi khirurgii, Dagestanski meditsinski institut, U.S.S.R.] [A case of malignant degeneration of the wall of a pulmonary hydatid cyst.] **Khirurgiya. Moscow**, 35 (1), 121–123. [In Russian.]

Askerkhanov reports on a case of pulmonary hydatid in which the cyst wall underwent malignant degeneration. Two operations were performed during which the cyst was drained and the chitinous membrane and malignant tissue removed. The patient died a month after the second operation and histological examination of the malignant tissue established planocellular cancer with pronounced polymorphism and a tendency to keratosis. N. Jones

- 409**—BAKER, N. F., COOK, E. F., DOUGLAS, J. R. & CORNELIUS, C. E., 1959. [University of California, School of Veterinary Medicine, Davis, California, U.S.A.] "The pathogenesis of trichostrongyloid parasites. III. Some physiological observations in lambs suffering from acute parasitic gastroenteritis." *Journal of Parasitology*, **45** (6), 643–651.

Baker and his colleagues studied peripheral blood patterns, plasma iron components, plasma copper and iron and copper stores in the livers of 11 lambs infected with mixed infections of *Ostertagia circumcincta*, *O. trifurcata*, *Trichostrongylus colubriformis*, *T. vitrinus*, *Haemonchus contortus*, *Nematodirus fillicollis*, *N. spathiger*, *Strongyloides papillosus*, *Cooperia curticei* and *C. punctata*. When the effects of *H. contortus* predominated, severe anaemia with iron deficiency was noted. In all the lambs the liver iron was reduced, but the plasma levels of iron were reduced only in lambs with liver iron stores of less than 0.7 mg. to 2.5 mg. per 100 gm. of fresh liver. Diet supplements of ferrous sulphate did not significantly increase the liver iron stores, even when all the *H. contortus* were removed. This was thought to be due either to interference with intestinal absorption of iron or to blood-sucking by species of *Ostertagia* and *Trichostrongylus*. It was estimated that *H. contortus* and possibly other genera removed 140 ml., i.e. 12% to 14% of the blood each day from one particular lamb. The peripheral blood patterns were commensurate with the pattern of haemorrhagic anaemia with superimposed iron deficiency.

G. Lapage

- 410**—BRAUN, A. J. & KEPLINGER, J. A., 1960. "The pathogenicity of meadow nematodes as determined by the growth of strawberry plants in a commercial planting." [Abstract of paper presented at the 19th Annual Meeting of the Northeastern Division, American Phytopathological Society, West Springfield, Mass., November 5–6, 1959.] *Phytopathology*, **50** (4), 239.

- 411**—BROWNE, S. G., 1959. [Baptist Mission Hospital, Yakasu, Belgian Congo.] "Neoplasms of the skin associated with onchodermatitis." *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **53** (6), 506–510.

Three cases of cutaneous tumours observed in nearly 8,000 cases of onchocerciasis, seen in the Oriental Province of the Belgian Congo, came from a village where the onchocercal infection rate was 100% and all the older inhabitants had advanced onchodermatitis. Two of these cases are described and illustrated by photographs. Histologically the tumours were typical papillomata. The dermis contained numerous onchocercal microfilariae. R. T. Leiper

- 412**—CHRISTIE, J. R. & PERRY, V. G., 1959. [Florida Agricultural Experiment Station, Gainesville, Florida, U.S.A.] "Mechanism of nematode injury to plants." In: Holton, C. S. et al. [Editors], "Plant pathology: problems and progress 1908–1958." **Madison: University of Wisconsin Press**, pp. 419–426.

In this review Christie & Perry deplore the "strange reluctance to accept at its face value evidence that nematodes are capable of causing serious crop losses". A possible explanation is that the main damage is internal and physiological, not visible mechanical injury. Salivary injections by nematodes may cause cellular hypertrophy, suppression or stimulation of mitosis, or dissolution of cell walls or middle lamellae. Wound punctures may serve as inlets for other organisms—if the nematodes are not more intimately involved, e.g. as inoculating agents. Plants vary in susceptibility to nematode injury and in suitability as food plants; these two attributes are not necessarily related, the whole plant-nematode-other organisms complex being very involved and little understood.

R. D. Winslow

- 413**—FURUSAWA, M., 1958. [Department of Parasitology, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [Experimental studies on the liver function in schistosomiasis japonica.] *Fukuoka Acta Medica*, **49** (5), 1158–1185. [In Japanese: English summary pp. 1158–1159.]

Investigations on the liver functions of rabbits experimentally infected with *Schistosoma japonicum* were pursued, the sera of these rabbits being fractionated by paper electrophoresis. Results of the liver function tests in 18 patients with schistosomiasis were also evaluated. The liver functions in this disease were characterized by the fact that hepatic excretory function was deranged in the acute stage. This, however, gradually improved but the dysfunctions in protein metabolism remained. Furusawa concluded from this data that the primary causes of the liver cirrhosis in schistosomiasis were embolism and toxins produced by the eggs.

Y. Yamao

- 414—GALL-PALLA, V. & GALL, Z., 1959. [Veterinarski zavod, Sarajevo, Yugoslavia.] "Serumske bjelančevine, kalcij i leukocitna formula kod trihinoznih bijelih štakora." *Veterinaria. Sarajevo*, 8 (3/4), 555–562. [English summary p. 555.]
Gall-Palla & Gall studied biochemical changes in the blood of 21 white rats, resulting from experimental infection with *Trichinella*. Blood was withdrawn before infection and up to 45 days after, the results being compared with those obtained from 22 controls. It was found that: (i) the quantity of albumins was already reduced, and the gamma globulin fraction had increased to a maximum, on the 20th day after infection; (ii) no significant changes were observed as regards other protein fractions and total proteins; (iii) the maximum increase (of 37%) in calcium was attained on the 20th day after infection; (iv) eosinophilia attained its maximum level (7%) on the 20th day after infection. No significant deviations were observed as regards other blood elements. N. Jones
- 415—GAVEZ, E. & SUDARIĆ, F., 1960. [Patološki institut, Veterinarski fakultet, Univerzitet Sarajevo, Yugoslavia.] "Cirrhosis (fasciolosa) carcinomatosa goveda." *Veterinaria. Sarajevo*, 9 (2), 317. [English summary p. 317.]
Gavez & Sudarić, referring to a previous paper [for abstract see Helm. Abs., 29, No. 1148] report on another case of primary carcinoma in association with *Fasciola* cirrhosis in a bovine. N. Jones
- 416—HIRAKAWA, M., 1959. [Department of Parasitology, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [Experimental studies on the third stage larvae of *Gnathostoma spinigerum*, with special reference to the pathological changes of host.] *Igaku Kenkyu. Fukuoka*, 29 (3), 895–916. [In Japanese: English summary pp. 914–915.]
Clinical, histological and pathological observations were made on albino rats and mice infected with third-stage larvae of *Gnathostoma spinigerum* obtained from *Ophicephalus argus*. The same studies were carried out on mice, which were injected with a physiological saline emulsion of the larvae. Comparing the findings in the two cases it was concluded that the pathological changes caused by the parasite were due to mechanical injuries produced by migrating larvae, and by toxic substances excreted or secreted by them. Y. Yamao
- 417—HORISAWA, D., 1958. [Masuda Live Stock Sanitary Service Center, Shimane Prefecture, Japan.] [Some surveys on a relationship between microfilaria and Wahi disease, a dermatitis in Shimane Prefecture.] *Journal of the Japan Veterinary Medical Association*, 11 (5), 202–205. [In Japanese.]
Wahi disease of cattle in Shimane Prefecture was believed to be caused by microfilariae of *Onchocerca gutturosa* and a few cases of the disease were recognized in cows showing microfilariae. Eosinophilia was noted in Wahi disease but the blood picture was normal where there were microfilariae without the disease. These facts seemed to suggest that factors other than microfilariae were involved in the production of Wahi disease. Y. Yamao
- 418—HUANG, M. H., CHIANG, S. C. & LU, C. W., 1960. [Department of Medicine, Jen Chi Hospital, Shanghai Second Medical College, Shanghai, China.] "Schistosomiasis dwarfism." *Chinese Medical Journal. Peking*, 80 (5), 437–440.
Huang *et al.* point out the lack of studies on schistosomiasis dwarfism in the literature and summarize recent work together with their own findings. Dwarfism cases are estimated to constitute about 1.5% of all cases of schistosomiasis and about 5.8% to 8.1% of late cases. The ratio of male to female dwarfs is approximately 2:1, and the majority of cases fall within the 16 to 20-year age group, retardation of growth being not yet noticeable in younger patients, while few older patients survive. Clinical observations and animal experiments alike point to frequent and repeated exposure to infection with schistosomiasis throughout childhood as the most important cause of dwarfism. The principal characteristics of the condition are stunting of bodily growth between the ages of 11 and 15, absence of pre-adolescent accelerated growth, small stature, under-development of sexual organs, absence of secondary sexual characteristics, and suppression of skeletal growth and maturation. Autopsy findings show under-development and atrophy of the adrenal cortices, thyroid, gonads and pituitary hypophysis. Mental retardation and dullness is not a feature of the condition; on the contrary, these dwarfs are unusually alert and sensitive. The authors conclude that pituitary function

in the dwarfs is depressed due to disturbances of the central nervous system occasioned by the toxic products of the parasites and ova and by the reflex mechanism from local lesions. Metabolic disturbances induced by cirrhosis of the liver and gastro-intestinal dysfunction may also be contributory. After suitable therapy (three-day treatment with tartar emetic) dwarfs regain normal pituitary function and grow, develop sexually and regain their lost working ability.

J. M. Watson

- 419—IBROVIĆ, M. & GALL-PALLA, V., 1959. [Klinika za unutrašnje bolesti Veterinarskog fakulteta Univerziteta u Sarajevu, Yugoslavia.] "Neka klinička, patološko-anatomska i biohemiska zapažanja u vezi s akutnom masovnom metiljavošću ovaca." *Veterinaria. Sarajevo*, 8 (3/4), 531-537. [English summary p. 531.]

Ibrović & Gall-Palla, after describing the clinical and anatomo-pathological aspects in sheep with an acute massive infection with liver-fluke, give the results of investigations of the composition of blood in five sheep with sub-acute infection and three with chronic or sub-chronic stages of the infection. These results, as compared with data on healthy sheep, show a marked decrease of the iron level, significant decrease in the level of phosphorus and a slight decrease in the levels of magnesium, sugar and potassium. On the other hand the level of calcium was slightly higher. The value of total serum proteins increased, as did the value of globulins, especially that of the gamma and beta fractions, while the level of albumins decreased. N. Jones

- 420—ISHIZAKI, T. ET AL., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Clinical studies on hookworm carriers. 4. An investigation into several components in blood with regard to manifestation of main symptoms.] *Japanese Journal of Parasitology*, 8 (4), 642-648. [In Japanese: English summary pp. 647-648.]

Blood coagulation time tended to decrease as the numbers of hookworms increased, but no correlation was found between number of hookworms and bleeding time, the time for coagulation to be first seen, and capillary resistance of the skin. Analysis of serum proteins showed that albumin decreased in hookworm carriers while globulin, especially γ -globulin, increased. The increase in γ -globulin was correlated positively with the number of hookworms and the blood reticulocyte count. It was interesting to note that occurrence of subjective symptoms was also correlated positively with the γ -globulin content. Concerning liver function tests, remarkable numbers of positive cases were found in thymol flocculation and zinc sulphate turbidity tests, but no change was found in the cephalin cholesterol flocculation, thymol turbidity, B.S.P. and Takada tests, or in urobilinogen in urine. The authors believe that a resistance mechanism against the injurious effect of hookworms must occur in man and this is supported by these observations. Alternatively this might be considered as a sensitivity to hookworm and the positive relation between γ -globulin and the occurrence of subjective symptoms supports this view.

Y. Yamao

- 421—ISHIZAKI, T. ET AL., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Clinical studies on hookworm carriers. 5. Analysis of outbreak mechanism of symptoms and signs.] *Japanese Journal of Parasitology*, 8 (5), 749-758. [In Japanese: English summary pp. 757-758.]

The symptoms and signs of carriers of *Necator americanus* were studied and compared with that of a control group who had no parasite ova in their faeces. It was concluded that gastro-intestinal symptoms and numbers of the hookworm were correlated with each other and with circulatory symptoms and anaemia; and that systemic and nervous symptoms were correlated with both the numbers of the worms and anaemia.

Y. Yamao

- 422—ITO, M., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Paragonimus westermani* along the Oita River. III. Roentgenological study on paragonimiasis.] *Journal of the Kurume Medical Association*, 22 (6), 2380-2392. [In Japanese: English summary p. 2392.]

64 cases of human paragonimiasis were studied by X-ray examination of the chest and in 57 cases (89.1%) abnormalities were found, cyst formation and exudative changes being the main findings. A typical cyst was round or elliptical and one or two centimetres in diameter, its long axis being parallel to that of the bronchi, surrounded by a thin connective tissue wall,

and its cavity was empty. Neither of the two symptoms, a linking of hili and a hilus lymph node enlargement, which differentiated paragonimiasis from tuberculosis was seen. Radiologically, the initial phase was exudative and in a relatively short interval it proceeded to a productive type, cyst formation, pleural exudation, pleural thickening or adhesion and finally to calcification. Y. Yamao

- 423—KATES, K. C. & TURNER, J. H., 1960. [Animal Diseases and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "An experiment in the combined pathogenic effects of *Haemonchus contortus* and *Nematodirus spathiger* on lambs." **Proceedings of the Helminthological Society of Washington**, 27 (1), 62-67.

When lambs were experimentally infected simultaneously with *Haemonchus contortus* and *Nematodirus spathiger* the pathogenic effects of both species appeared to be enhanced. Control lambs infected with *H. contortus* only became anaemic but suffered only a slight loss of appetite and gained only slightly less weight than worm-free controls. Lambs with dual infections lost weight, became severely anaemic, suffered diarrhoea and their food intake was reduced from 3 lb. per day to 0.5 lb. per day. One of the two infected lambs died. No control lambs infected with *N. spathiger* only were included, but results in earlier experiments [for abstract see Helm. Abs., 22, No. 222cl] may be used for comparison. H. McL. Gordon

- 424—KATES, K. C., WILSON, G. I. & TURNER, J. H., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Experimental studies on the relationship of *Ostertagia circumcincta* to parasitic gastritis in sheep and goats." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 42-43.

- 425—KÄMPFE, L., 1960. [Zoologisches Institut, Griefswald, Germany.] "Die räumliche Verteilung des Primärbefalls von *Heterodera schachtii* Schmidt in den Wirtswurzeln." **Nematologica**, 5 (1), 18-26. [English summary p. 25.]

The roots of rape (*Brassica napus* L. var. *arvensis* (Lam.) Thell.) and sugar-beet (*Beta vulgaris* L. f. *altissima* D.C.), grown in pots inoculated with beet eelworm (*Heterodera schachtii* Schm.), were examined after 7, 14, 21 and 28 days to determine the spatial distribution of invading larvae. The root tips, points of origin of the lateral roots and the intervening regions are considered separately. Comparing the number of larvae at the points of origin of the laterals with those in the rest of the roots for the whole root system, Kämpfe concludes that there is no significant difference, but that "Reference to the numbers in lengths of roots from individual regions, however, shows a clear preference for the points of origin of the lateral roots at all times of examination. In contrast to results from experiments in agar, the root tips show only a relatively small degree of infestation". Finally he concludes that "the observed pattern of invasion is in accordance with the hypothesis of root attraction and also with that of random movement, but favours the former". A. M. Shepherd

- 426—KIKUCHI, H., 1958. [The Surgical Clinic of Prof. T. Maki, Faculty of Medicine, Hirosaki University, Hirosaki, Japan.] [Experimental study on duodenitis caused by *Trichostrongylus orientalis*.] **Hirosaki Medical Journal**, 9 (2), 267-280. [In Japanese: English summary pp. *42-*43.]

In rabbits experimentally infected with *Trichostrongylus orientalis*, acute or sub-acute duodenitis was observed histologically 7 to 15 days after infection and chronic duodenitis more than three weeks after infection. Kikuchi states that a large concentration of *T. orientalis* caused chronic duodenitis and that, as a natural consequence of this, papillitis of the duodenum was seen; *T. orientalis* was also a factor in the generation of biliary tract diseases. Y. Yamao

- 427—KITSUKI, T., 1958. [Department of Parasitology, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [A study of serum protein in gnathostomiasis.] **Igaku Kenkyu. Fukuoka**, 28 (5), 1370-1394. [In Japanese: English summary pp. 1393-1394.]

Rabbits were infected with third-stage larvae of *Gnathostoma spinigerum* from *Ophicephalus argus*. The changes of serum protein fractions of the rabbits indicated a disturbed protein metabolism, resulting from the mechanical damage caused by the larval migration and from the liver impairment brought about by toxic substances excreted or secreted by the worms. A

comparative examination of the serum protein fraction in normal persons and patients with gnathostomiasis showed that the amount of albumin and the albumin/globulin ratio were below normal and that of γ -globulin above normal, that the amount of γ -globulin was not correlated with any of the intradermal reactions, and that Takata's test was negative in all the cases.

Y. Yamao

428—KUBOTA, H., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Clinical analysis of hookworm disease with regard to the balance of the autonomic nervous system.

1.] **Japanese Journal of Parasitology**, 8 (4), 601-609. [In Japanese: English summary p. 609.]

Factor analysis by Wenger-Okinaka's method was performed on the agricultural population of Machida city, on the outskirts of Tokyo, containing carriers of *Necator americanus*. The histogram of individual factor scores formed a normal distribution type maintaining the balance of sympathetic and parasympathetic nervous systems. No significant difference was observed between the individual factor scores and the number of hookworms. Observing the balance of autonomic nervous system from aspects of their symptoms such as stomach ache, abdominal pain, sweatiness and shoulder pain, the parasympathetic dominance was proved with p less than 0.025-0.01 in the controlled cases of the mass.

Y. Yamao

429—KUBOTA, H., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Clinical analysis of hookworm disease with regard to the balance of autonomic nervous system. 2.]

Japanese Journal of Parasitology, 8 (5), 687-695. [In Japanese: English summary pp. 694-695.]

Clinical investigations on ancylostomiasis, carried out at a farming village near Tokyo, showed that the major clinical symptoms which characterized the disease were the results of the vital defence reaction and were caused by the parasympathetic predominance.

Y. Yamao

430—KURATA, M. ET AL., 1959. [First Department of Internal Medicine, Kurume University School of Medicine, Kurume, Japan.] [Studies on schistosomiasis japonica. (Second report.) Chiefly on the clinical and laboratory features concerning the serum electrophoretic pattern, liver function and pathology.] **Journal of the Japanese Society of Internal Medicine**, 48 (9), 1421-1430. [In Japanese.]

28 cases of human schistosomiasis were studied. From the results of liver function tests, liver biopsy, serum electrophoresis and faecal examinations, the disease picture was divided into four groups. These four groups were compared with the observations made on experimental schistosomiasis in a rabbit. The first group seemed to correspond to an acute phase, the second group to sub-acute or pre-cirrhotic, the third group to a minimum infection or recovery or chronic, and the fourth group to a cirrhotic phase.

Y. Yamao

431—LADOSKY, W., 1958. "O comportamento do pancreas na esquistossomose mansonica hepato-esplênica. Estudo comparativo com o comportamento do mesmo órgão na cirrose de Morgagni-Laennec." **Revista da Associação Médica Brasileira**, 4 (2), 141-150.

Ladosky gives a histological comparison of the pancreatic changes in 19 cases of hepatosplenic schistosomiasis and 14 cases of Laennec's cirrhosis. In the former, ova of *Schistosoma mansoni* were found in 10 cases and the fibrosis was usually interstitial and discrete, often in relation to the ova. In the latter there was diffuse interstitial pancreatitis with marked interlobular fibrosis. The author considers that the differences found in the two diseases are not due solely to portal hypertension.

W. K. Dunscombe

432—LELAND, Jr., S. E., DRUDGE, J. H. & WYANT, Z. N., 1959. [Kentucky Agricultural Experiment Station, Lexington, U.S.A.] "Blood and plasma volume, total serum protein, and electrophoretic serum fractionation of sheep experimentally infected with *Trichostrongylus axei*." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 42.

433—LEONTEV, F. M., 1959. [Gelmintologicheski otdel, Kazanski nauchno-issledovtelski veterinarni institut, U.S.S.R.] [A case of *Setaria* causing orchitis in a colt.] **Trudi Kazanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, No. 13, pp. 439-440. [In Russian.]

Leontev reports finding *Setaria equina* in the scrotum of a colt at the time of castration. The parasite was recovered from straw-coloured fluid contained in the cavity formed by testis and tunica vaginalis communis.

N. Jones

- 434—MAGLAJIĆ, E., OŽEGOVIĆ, L. & TURANČIĆ, V., 1959. [Klinika za unutarnja obolenja domaćih životinja Veterinarskog fakulteta Univerziteta u Sarajevu, Yugoslavia.] "Vrijednosti i odnosi serumskih bjelancevina kod distomatoznih goveda." **Veterinaria. Sarajevo**, 8 (3/4), 525–530. [English summary p. 525.]

Maglajić *et al.* investigated serum protein values in 91 cattle with fascioliasis. Absolute quantity of total proteins, evaluated by the method of Van Slyke, ranged from 5.15 gm.% to 8.23 gm.%, which are lower values than those found in healthy cattle. These reduced values were proportional to the intensity of infection. The relative values of individual fractions, as established by paper electrophoresis, were considerably changed; the gamma globulin fraction was found to be markedly increased but alpha and beta globulin fractions were more or less unchanged. Gamma globulins increased as albumin diminished. The same interrelation was found to exist between gamma and alpha globulins. No obvious correlation was observed amongst individual fractions of other serum proteins. N. Jones

- 435—MILDENBERGER, G. & WARTENBERG, H., 1958. [Institut für allgemeine Botanik der Friedrich-Schiller-Universität Jena, East Germany.] "Histologische Untersuchungen der Nematodengallen in den Wurzeln der Kartoffelpflanze, (*Heterodera rostochiensis* Woll. und *Meloidogyne spec. in Solanum tuberosum* L.)." **Zeitschrift für Pflanzenkrankheiten (Pflanzenpathologie) und Pflanzenschutz**, 65 (8), 449–464. [English summary p. 463.]

The changes occurring in the cells of the root of potato after invasion by *Heterodera rostochiensis* are described. Brief mention is also made of galls produced by *Meloidogyne* spp. A. M. Shepherd

- 436—MOSHKOVSKI, S. D., 1959. [Institut meditsinskoi parazitologii i tropicheskoi meditsini im. Martinovskogo, Ministerstvo zdravookhaneniya SSSR, Moscow, U.S.S.R.] [Pathogenesis of helminthiasis.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 28 (6), 717–727. [In Russian: English summary p. 727.]

Moshkovski considers the principal factors in the pathology of helminth infections under the following headings: (i) loss of substances by the host; (ii) the effect of the parasite on the host at the site of its localization; (iii) the effect on the host of the chemical products of the parasite; (iv) allergic reactions; and (v) the promotion and aggravation of infectious diseases. G. I. Pozniak

- 437—OBA, N., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Gnathostoma spinigerum*. 2. The changes of blood pictures and body-weights of rabbits injected with the media in which the larvae of *Gnathostoma spinigerum* were cultured.] **Journal of the Kurume Medical Association**, 22 (8), 3006–3011. [In Japanese: English summary p. 3011.]

Larvae of *Gnathostoma spinigerum* were cultured at 38°C. for four days in 0.85% sodium chloride solution which was then injected subcutaneously into adult rabbits. No change was observed in body-weight and leucocyte counts of the rabbits so treated, but eosinophilia and increase of pseudo-eosinophil leucocytes were found to occur. Y. Yamao

- 438—OGINO, Y., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [The relation between anaemia and ancylostomiasis in the rural areas. 3. Haemoglobin content in blood of non-infected cases in view of iron intake.] **Japanese Journal of Parasitology**, 8 (5), 702–707. [In Japanese: English summary p. 707.]

Among residents in a farming area, considerable numbers who were found to be free of *Ancylostoma* had anaemia, the cause of which was confirmed to be an insufficient intake of iron. Y. Yamao

- 439—OHASHI, Y. & MURAI, T., 1959. [Hatano Tobacco Experiment Station, Hatano, Kanagawa, Japan.] [Studies on bacterial wilt resistance of tobacco. II. Relationship between root injury and bacterial invasion.] **Bulletin of the Hatano Tobacco Experiment Station**, No. 44, pp. 51–64. [In Japanese: English summary p. 60.]

Ohashi & Murai used the wilt resistant (Dixie Bright 101) and susceptible varieties (Little Dutch, Delcrest and Bright Yellow) to find the possible relationship between root-knot nematode injury and bacterial invasion in tobacco. They found that: (i) susceptible varieties showed

the severest wilt symptoms when they were inoculated with the bacterial suspension immediately after cutting, while wilt symptoms scarcely appeared on plants inoculated 24 or 48 hours after cutting or on plants not wounded mechanically but inoculated; the resistant variety showed the same tendency; (ii) in nematode-bacteria-inoculated soil, Bright Yellow exhibited wilt symptoms later than those inoculated with wilt bacterium alone immediately after cutting, while Dixie Bright 101 wilted as early as those. The authors concluded that the wounds made by the nematode facilitated invasion by wilt bacteria.

M. Ichinohe

- 440—OVNATANYAN, K. T., 1959. [Kafedra fakultetskoi khirurgii, Stalinski meditsinski institut imeni A. M. Gorkogo, U.S.S.R.] [Perforation of the intestinal tract by *Ascaris*.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 28 (4), 422–426. [In Russian: English summary p. 426.]

Ovnatanyan considers the different pathological conditions which may lead to intestinal perforation by *Ascaris*. He describes a case in which *Ascaris* perforated healthy intestine.

G. I. Pozniak

- 441—RITTERSON, A. L. & MAUER, S. I., 1957. [Departments of Bacteriology and Anatomy, University of Rochester School of Medicine and Dentistry, Rochester, New York.] “Adrenal lipid response in Chinese hamsters infected with *Trichinella spiralis*.” **Science. Lancaster, Pa.**, 126 (3286), 1293–1294.

Ritterson & Mauer found that the histologically demonstrable lipid in the adrenal glands of Chinese hamsters decreased during the early stages of infection with *Trichinella spiralis*. On the 14th day after infection lipid reappeared and was normal by the 26th day. The adrenal of the Chinese hamster thus responded to stress in the conventional manner. However, the myositis which occurred during the 14th to 26th days of infection did not cause stress which affected adrenal lipid.

W. P. Rogers

- 442—RODGER, F. C., 1959. [World Health Organization, Geneva, Switzerland.] “Ocular lesions associated with onchocerciasis.” [Correspondence.] **Transactions of the Royal Society of Tropical Medicine and Hygiene**, 53 (6), 536–537.

- 443—RODGER, F. C., 1960. [University Laboratory of Physiology, Oxford, U.K.] “Ocular lesions associated with onchocerciasis.” [Correspondence.] **Transactions of the Royal Society of Tropical Medicine and Hygiene**, 54 (2), 197.

Further to his letter in **Trans. R. Soc. trop. Med. Hyg.**, 1959, 53, p. 536, Rodger points out that the possible distinction between the two types of posterior lesions in ocular onchocerciasis is not well understood. They are a posterior circumscribed choroidal sclerosis (the fundus lesion described by Ridley as specific, but which might be hereditary) and a non-specific chorioretinitis, which often goes on to sectorial or complete choroidal sclerosis. The former, which Rodger has called the posterior degenerative lesion, is rare, while the latter is common, starts as uveitis and can nearly always be associated with the presence of the micro-filaria of *Onchocerca volvulus*.

G. I. Pozniak

- 444—SELIVANOVA, V. M., 1959. [Ordel vitamina C, Gosudarstvennii nauchno-issledovatel'ski institut vitaminologii, Ministerstvo zdравookhraneniya S.S.S.R.] [The effect of the migration of *Ascaris lumbricoides* larvae on the ascorbic acid content in the organs of experimental animals (guinea-pigs and rats).] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 28 (4), 440–443. [In Russian: English summary p. 443.]

The migration of *Ascaris lumbricoides* larvae in rats had given rise, one week after infection, to a statistically significant reduction in the ascorbic acid level in the liver and kidneys, but not in the intestine, brain, spleen and adrenals. No such reduction was observed, however, in guinea-pigs, both with an adequate supply of ascorbic acid in the diet (30 mg. per day) and with smaller amounts (10 mg. per day).

G. I. Pozniak

- 445—SHINOHARA, M., 1960. [Department of Medical Zoology, Niigata University School of Medicine, Niigata, Japan.] [Clinical studies on hookworm infection, with special reference to the comparative blood findings between *Ancylostoma duodenale* and *Necator americanus*.] **Niigata Medical Journal**, 74 (2), 158-174. [In Japanese.]

The infection rate of hookworms in rural districts of Takada, Niigata Prefecture, was more than 40% and the disease was more prevalent among women than men. More cases of *Necator americanus* were found than of *Ancylostoma duodenale*. Fatigue, vertigo, short breath, palpitation, nausea, dermatitis and morbid appetite were more or less frequent symptoms among the hookworm carriers. Objective findings were relatively few and more observations were made in the cases of *A. duodenale* infection than in *N. americanus*. Anaemia, palpable liver, accentuation of the second pulmonary tone, systolic murmur, oedema and deformity of nails were noted. In the case of *A. duodenale*, anaemia was noted in men who carried more than 34 parasites (e.p.g. 3,600) and in women with more than 46 worms (e.p.g. 4,200); while in the case of *N. americanus* anaemia began to be noted with e.p.g. of 6,600 in men and 10,200 (310 worms) in women. Except for a single infection of *N. americanus*, the hookworm carriers showed a slight increase in reticulocytes and a marked eosinophilia. Y. Yamao

- 446—TAKAYAMA, S., SHIRAKAWA, M. & HIRANO, H., 1959. [Department of Hygiene and Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [A histopathological investigation of the stomach tumour of a cat experimentally infected with *Gnathostoma spinigerum*.] **Japanese Journal of Parasitology**, 8 (5), 829-834. [In Japanese: English summary p. 831.]

Takayama *et al.* fed third-stage larvae of *Gnathostoma spinigerum* from *Ophicephalus argus* per os to a cat. Six months later they found stomach tumours in the cat which were caused by the infection with *G. spinigerum*. Y. Yamao

- 447—WU, T. T., CH'EN, T. H. & CHU, C., 1960. "The relationship of schistosomiasis to carcinoma of large intestine." **Chinese Medical Journal. Peking**, 80 (3), 231-242.

Of 1,193 cases of carcinoma of the large intestine observed in China in an area of endemic schistosomiasis, 129 also had schistosomiasis. In this group, the average age was 37.59 years (31 to 40), the proportion of men and women 4 : 1 and the lesions were typical of schistosomiasis; in cases with carcinoma only, the corresponding figures were 44.04 years (41 to 50) and 2 : 1, while the average age of schistosomiasis patients without carcinoma was 32.3 years. In the first group macroscopical examination showed the affected intestinal wall to be thickened due to chronic inflammation and polyps were present in the vicinity of, as well as on the surface of, tumours. These facts are considered to indicate that schistosomiasis is a causal agent in the subsequent development of intestinal carcinoma. G. I. Pozniak

- 448—YANAI, T., 1959. [Department of Parasitology, Research Institute for Microbial Diseases, Osaka University, Osaka, Japan.] [Studies on the behaviour and fate of various ascarid eggs placed outside the intestine of the host. 2. Experiment with eggs placed in the brain of mice.] **Japanese Journal of Parasitology**, 8 (5), 775-791. [In Japanese: English summary p. 787.]

Unsegmented eggs of swine, canine and equine ascarids were inoculated into the right hemisphere of the brain of a mouse by direct intracerebral injection. Within the cranial cavity, the eggs were transferred from the brain parenchyma into the ventricles and the meningeal cavity, and a considerable number of them were found accumulated in the subarachnoid cavity at the cranial base. Some eggs were also found in the tissues outside the cranial cavity, namely, in the loose tissues around the neck, especially of the pharynx, larynx and bronchus. Furthermore, there were some eggs reaching as far as the loose tissues of thoracic and abdominal muscles, lungs and liver. In the brain, the eggs of swine and canine ascarids developed to the early morula stage, while those of equine ascarids were able to reach an embryonated stage. The eggs in the brain were destined to be enclosed by granulation tissue of mesenchymal origin, and finally to be disintegrated and absorbed. Changes could be differentiated into two categories: (i) pathological changes due to mechanical damage following injection of the eggs; (ii) changes caused by the eggs themselves. Histologically, however, they could be divided into five fundamental types: (i) infiltrative, (ii) productive, (iii) transitional, (iv) combined, and (v) sclerotic. The whole course of pathogenesis was divided into three stages, each involving two or three types of change in varying degrees. Y. Yamao

Immunity

- 449—AKAMATSU, T., 1959. [Department of Pathology, Osaka Medical College, Takatsuki, Osaka, Japan.] [Experimental pathological studies on the ascarid cavity fluid and its fractions. 2. Anaphylaxis in the kidney.] **Japanese Journal of Parasitology**, 8 (4), 621–632. [In Japanese: English summary p. 630.]

Rabbits were first immunized by injecting body-cavity fluid of *Ascaris lumbricoides* from pigs. Active anaphylactic phenomena, which were evoked by injecting the cavity fluid and its protein or polysaccharide fraction into the renal arteries, were observed histologically in the kidney for the purpose of investigating the immunological characteristics of pig ascarid cavity fluid and its various fractions. The polysaccharide component was proved to be a serotropic antigen, which caused a serotropic antigen-antibody reaction, while the protein component was found to be a histotropic antigen, causing a histotropic antigen-antibody reaction. The body-cavity fluid showed characteristics of the protein component. Y. Yamao

- 450—AKAMATSU, T., 1959. [Department of Pathology, Osaka Medical College, Takatsuki, Osaka, Japan.] [Experimental pathological studies on the allergy by the ascarid cavity fluid and its fractions. 8. Histological changes in immunized rabbits.] **Japanese Journal of Parasitology**, 8 (5), 792–804. [In Japanese: English summary p. 801.]

Total cavity fluid of pig *Ascaris*, and its protein and polysaccharide fractions were repeatedly injected intravenously into rabbits; the histological changes, blood picture and serum iron content were investigated. The polysaccharide fraction was proved to be a hapten and its injections caused no allergic changes, although a slight toxicity was observed. The injections of the protein fraction brought out two different types of vital reactions, one of which was due to the existence of a histotropic antigen which caused the extra-vascular antigen-antibody reactions, while the other type was repeated haemolysis *in vivo*. Total cavity fluid injections brought about still another change due to the intra-vascular antigen-antibody reaction. Y. Yamao

- 451—BRIGGS, N. T., 1959. [University of Texas Medical Branch at Galveston, U.S.A.] “The effect of cortisone on natural resistance and acquired responses of the white rat to infection with *Litomosoides carinii*.” [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 37.

- 452—DUNSMORE, J. D., 1960. [Department of Veterinary Pathology, University of Sydney, New South Wales, Australia.] “Retarded development of *Ostertagia* species in sheep.” [Correspondence.] **Nature, London**, 186 (4729), 986–987.

Infective larvae of *Ostertagia circumcincta* were given to worm-free lambs at 1,000 and 100,000 per head. Worms recovered by peptic digest when the sheep were autopsied 14 days later were counted and measured. In lambs given 100,000 larvae the worms showed a bimodal size distribution with 35% to 75% 1 mm. to 2 mm., a few 3 mm. to 5 mm. and the remainder 5 mm. to 8 mm. long. In lambs given 1,000 larvae less than 2% of the worms were retarded, most showing a normal distribution around 6 mm. to 11 mm. long. It appeared that retarded larvae, very small fourth-stage forms, failed to recommence growth after the third moult. Worms from the 100,000 dose which had developed beyond 1 mm. to 2 mm. still failed to attain the size of those which developed from the dose of 1,000 larvae. In sheep similarly infected but autopsied at 56 days, worms from the higher dose, although mature and producing eggs, were still smaller than those which developed from the lower dose. H. McL. Gordon

- 453—ELSDON-DEW, R., 1958. “The host parasite relationship in Bilharzia.” **South African Journal of Science**, 54 (2), 43–44.

Some aspects of the host-parasite relationship are briefly discussed. As it has been shown that there exists in animals a premunity to bilharzia [for abstract see Helm. Abs., 26, No. 147b] the author questions whether the disease is being approached in the right way. He suggests that premunization of a population might be possible if all children were infected with, for example, a pair of sterile worms. D. F. Mettrick

- 454—FORŠEK, Z. & RUKAVINA, J., 1959. [Zavod za parazitologiju Veterinarskog fakulteta univerziteta u Sarajevu, Yugoslavia.] "Eksperimentalna imunizacija pasa protiv *Echinococcus granulosus* I. Prva zapažanja." *Veterinaria. Sarajevo*, 8 (3/4), 479–482. [English summary p. 479.]

Foršek & Rukavina prepared antigens from hydatid cysts from sheep, pigs and cattle, using hydatid fluid, extract of scoleces and extract of germinative and cuticular membranes. Antigen value was determined by the RVK method as well as by titration against serum of immunized animals. 40 dogs, of which 10 were controls, were infected with fertile hydatid cysts 60 to 90 days after immunization. All the dogs were bled 45 to 160 days after infection. The authors claim that: (i) the immunized animals had much smaller worm burdens than the controls; (ii) the worm burden diminished with longer intervals between infection and bleeding; (iii) the antibody titre in the serum was in constant proportion to that of the antigen tested and diminished with time.

N. Jones

- 455—FURUNO, O., 1959. [Department of Parasitology, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [An immunological study on gnathostomiasis (precipitin ring tests and Sarles' phenomenon).] *Igaku Kenkyu. Fukuoka*, 29 (8), 2802–2822. [In Japanese: English summary p. 2822.]

In rabbits with gnathostomiasis, Sarles' phenomenon and precipitation reaction appeared two to three weeks after the infection, the former being most marked in two to three weeks and the latter after six weeks. Sarles' phenomenon of patients' serum was found to be weak and sometimes became negative two years after the infection. The precipitation reaction always showed at least 1 : 800 titre with the larval extract and was specific, with its reactivity being paralleled with the intradermal reaction, and remained positive when Sarles' phenomenon became negative. Precipitation reaction with the worm extracts seemed valuable in diagnosing gnathostomiasis.

Y. Yamao

- 456—GOLDEN, A. M. & SHAFER, T., 1959. [Crops Research Division, U.S.D.A., Salinas, California, U.S.A.] "Susceptibility of tomato (*Lycopersicon esculentum*) to the sugar-beet nematode (*Heterodera schachtii*)." *Plant Disease Reporter*, 43 (11), 1196–1197.

Contrary to the observations of previous workers, Golden & Shafer found in tests at Salinas, California, that tomato (*Lycopersicon esculentum*) was susceptible to beet eelworm (*Heterodera schachtii*). The plants were tested in soil heavily infested with cysts of beet eelworm. Most of the plants were lightly infected, two moderately and one heavily. Young females and cysts from the roots contained viable eggs. When these cysts were tested on sugar-beet, a population similar to *H. schachtii* was established.

A. M. Shepherd

- 457—HERLICH, H., 1960. [Regional Animal Disease Research Laboratory, Auburn, Alabama, U.S.A.] "Age resistance of cattle to nematodes of the gastrointestinal tract." *Journal of Parasitology*, 46 (3), 392–397.

Herlich describes experiments to study the age resistance of cattle to the gastro-intestinal nematodes, *Haemonchus placei*, *Ostertagia ostertagi*, *Trichostrongylus axei*, *T. colubriformis*, *Cooperia punctata*, *C. pectinata*, *Nematodirus helvetianus* and *Oesophagostomum radiatum*. In three experiments calves five to six-and-a-half months old and steers 18 to 23½ months old were grazed on contaminated pastures, and in the fourth experiment calves six to eight-and-a-half months old and steers 25 months old were experimentally infected with the same number of larvae. The adult cattle were almost completely refractory to infection with *N. helvetianus*, *C. pectinata* and *T. colubriformis*. With the other species, there was no apparent difference between the age groups in the parasites' rate of development or in their egg production, but the calves had an average of 2.5 to 5.5 times as many worms as the steers. Four calves showed clinical symptoms, but no adult animal was affected. It is concluded that, although the adult animals acquired appreciable numbers of worms, they were generally more resistant to both the parasites themselves and to their debilitating effects.

F. H. S. Roberts

- 458—HERLICH, H. & MERKAL, R., 1959. [Regional Animal Disease Research Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Auburn, Alabama, U.S.A.] "Studies on the serological and immunological responses of calves artificially infected with the stomach hair-worm, *Trichostrongylus axei*." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 42.

459—IRALU, V., 1960. [University of North Carolina, U.S.A.] "Studies on the role of the properdin system in natural immunity to certain animal parasites." **Dissertation Abstracts**, 20 (10), 4085-4086.

460—ITO, M., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Paragonimus westermani* along the Oita River. II. Precipitation reaction of paragonimiasis.] **Journal of the Kurume Medical Association**, 22 (6), 2371-2379. [In Japanese: English summary p. 2379.]

A precipitation reaction between a whole worm antigen of *Paragonimus westermani* and sera from rabbits immunized by a whole worm extract, experimentally infected dogs and paragonimiasis patients, was studied. Precipitin value of more than 1 : 800 was found to have a diagnostic value. Y. Yamao

461—LAMY, L., BÉNEX, J. & GLEDEL, J., 1959. [Institut Pasteur, Service de parasitologie et Services vétérinaires sanitaires de la Seine, France.] "Étude de la réaction de fixation du complément à divers antigènes de cestodes chez le mouton. Deuxième note." **Bulletin de la Société de Pathologie Exotique**, 52 (2), 193-198.

Lamy *et al.* carried out complement fixation tests, using various antigens, with the sera of 48 sheep of which 11 were known to be infected with *Cysticercus tenuicollis*. With two antigens from *C. tenuicollis* (one prepared from cyst fluid and the other from crushed larvae) all but one sheep gave positive results. With antigens prepared from adult *Moniezia expansa* and *Taenia saginata* all were positive. With hydatid antigen (from cysts in cattle) five of the eleven sheep with *C. tenuicollis* and five of those with undetermined infections gave positive results. Sera from eight cattle, known to have hydatid cysts, were negative to hydatid antigen and to antigens from *C. tenuicollis*, *M. expansa* and *T. saginata*. The authors conclude from these results that there are cross reactions between *Moniezia* and *T. saginata*, that the presence of *Moniezia* enhances the positive reactions to *C. tenuicollis* and that complement fixation reactions to hydatid antigen in cattle or man should only be regarded as significant if positive.

S. Willmott

462—MAYHEW, R. L., 1959. [Louisiana State University, U.S.A.] "Immunity to *Cooperia punctata* and *Oesophagostomum radiatum* in cattle." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 44.

463—MIYATAKE, M., 1958. [Second Department of Internal Medicine, Tottori University School of Medicine, Yonago, Japan.] [Schwartzman-type tissue reaction to hookworm.] **Journal of the Yonago Medical Association**, 9 (3), 395-411. [In Japanese.]

A Schwartzman-type tissue reaction was induced by injecting the filtrate from media in which larval *Ancylostoma duodenale* had been cultured into the intradermal tissue of the ear and duodenal submucosa of a rabbit. The intradermal reaction induced by the protein fraction of an emulsion of the adult worms was strongly positive, but the reaction by the polysaccharide and fat fractions was rather weak. The inhibiting effect of Gross-Ogata at the intradermal tissue and duodenal submucosa was produced by the larval culture medium filtrate, an emulsion of the adult worms and a concentrated, defatted, deproteinized fraction of the culture media. The most intense Schwartzman effect was observed in the polysaccharide fraction of the culture medium filtrate. The Schwartzman reaction induced by the hookworm was observed to be parallel to the rabbit Forssman antibody value, although the polysaccharide fraction was always strongly positive, notwithstanding the Forssman antibody value. Y. Yamao

464—NAGAMOTO, T., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Studies on *Clonorchis sinensis*. II. Immunological studies on *Clonorchis*.] **Journal of the Kurume Medical Association**, 22 (4), 1399-1417. [In Japanese: English summary pp. 1416-1417.]

Cross intradermal reactions between *Clonorchis sinensis* and *Schistosoma japonicum* were quite rare, but among *C. sinensis* and *Paragonimus* and *Fasciola*, a common skin reaction occurred fairly often; consequently a differential diagnosis must be made. When a wide-spread infection

of *C. sinensis* was suspected, the intradermal reaction seemed valuable for a screening test. The serum precipitation and the urine precipitation tests should also be used for an early diagnosis and for evaluation of the therapeutic effects. Y. Yamao

- 465—NAGATA, M., SHIMIZU, R. & YAMADA, K., 1958. [College of Agriculture, University of Osaka Prefecture, Sakai, Osaka, Japan.] [Studies on the diagnosis of canine filariasis. II. Intradermal test with antigen extracted from worm body.] *Journal of the Japan Veterinary Medical Association*, **11** (11), 539–545. [In Japanese.]

As previously reported, the antibody extracted from whole canine filariae showed more than 84% validity in diagnosing canine filariasis when used in the intradermal test. Various fractionated antigens obtained from the whole worm antigen were proved to be less effective. Diagnosis of filariasis by intradermal tests was possible before the worms reached the heart and started to produce microfilariae, and when microfilariae were difficult to find. The intradermal reaction was an antigen-antibody reaction. The antibody seemed to be produced soon after infection took place. Y. Yamao

- 466—NAGATA, M. & YAMADA, K., 1958. [College of Agriculture, University of Osaka Prefecture, Sakai, Osaka, Japan.] [Studies on the diagnosis of canine filariasis. I. Experiment on an intradermal test with antigen extracted from filarial body.] *Journal of the Japan Veterinary Medical Association*, **11** (5), 197–200. [In Japanese.]

Canine filariae were extracted with a solution which consisted of one volume of sodium chloride 50 gm., potassium hydrogen phosphate 3.63 gm. and disodium orthophosphate 14.3 gm., distilled water 1,000 ml., one volume of 4% aqueous solution of phenol and eight volumes of distilled water. Antigen was made from the extract. The antigen, when injected intradermally into the skin of the inner side of the thigh, was confirmed to be reliable in diagnosing filariasis. No notable group antigen reaction was observed between canine filaria and other intestinal parasites of dogs. Y. Yamao

- 467—OKUNO, K., 1959. [Department of Parasitology, Gifu Prefectural Medical School, Gifu, Japan.] [Studies on *Ascaris* antigens. II.] *Acta Scholae Medicinalis in Gifu*, **7** (2), 573–584. [In Japanese: English summary p. 573.]

By means of intraperitoneal injections with various antigens from *Ascaris lumbricoides* (a body-cavity fluid, a K-antigen, a metabolite and a body-wall extract) the author investigated the precipitation test with the corresponding antisera. Antiserum from the body-cavity fluid reacted rather specifically and it reacted negatively to the body-wall extract. The antisera from the body-wall extract and the K-antigen reacted positively to all four antigens. The antiserum from the metabolite reacted positively only to the metabolite and the body-wall extract. Y. Yamao

- 468—SADUN, E. H., WALTON, B. C., BUCK, A. A. & LEE, B. K., 1959. [406th Medical General Laboratory, APO 343, San Francisco, California, U.S.A.] "The use of purified antigens in the diagnosis of clonorchiasis sinensis by means of intradermal and complement fixation tests." *Journal of Parasitology*, **45** (2), 129–134.

Sadun *et al.* prepared four antigens from adult *Clonorchis sinensis*, namely, a relatively crude fat-free antigen (CC), an acid-soluble protein fraction (CM), an acid-insoluble, alkali-soluble protein fraction (CM-ins) and a lipid-free, borate buffer extraction (CTP). In intradermal tests the first three were compared and the CM antigen found to be the most reliable. This was then used on 132 persons with *C. sinensis*, 50 with *Schistosoma japonicum*, 93 with *Paragonimus westermani* and 120 without trematodes and of these, respectively, 129, five, 53 and two gave positive results. In order to determine if positive specific reactions could be observed in younger and presumably asymptomatic individuals 356 children, aged 8 to 14 years, were investigated by single stool examinations and intradermal tests. A remarkably close correlation

was found, only 38 of a total of 148 who showed eggs in the stools giving negative intradermal tests and only 10 of those positive to the intradermal test showing no eggs. In complement fixation tests the antigens CM-ins and CTP appeared the most sensitive. Only two of 25 sera from clonorchiasis patients reacted negatively and only one of 20 sera from trematode-free persons reacted positively. Some cross reactions were observed with paragonimiasis, schistosomiasis, tuberculosis and leptospirosis. Some of the cross reactions are believed to have been due to storage or to previous infection with trematodes. The development of antibody response was studied in nine rabbits. S. Willmott

469—SCOTT, J. A. & CROSS, Jr., J. H., 1959. [University of Texas Medical Branch, Galveston, U.S.A.] "Immunity produced by two strains of *Litomosoides carinii* in gerbils and cotton rats." [Abstract.] **Journal of Parasitology**, **45** (4, Sect. 2), 37–38.

470—STAHL, W. B., 1960. [Columbia University, U.S.A.] "Studies on the variations in susceptibility of albino mice to infection with the pinworm, *Aspicularis tetraptera*." **Dissertation Abstracts**, **20** (12), 4761.

471—STELTER, H. & RAEUBER, A., 1959. [Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Institut für Pflanzenzüchtung Gross-Lüsewitz.] "Untersuchungen über den Kartoffelnematoden (*Heterodera rostochiensis* Wollenweber). V. Die Veränderung einer Nematodenpopulation unter dem Einfluss widerstandsfähiger und anfälliger Kartoffel-Varietäten in einjährigen Topfversuchen." **Zeitschrift für Pflanzenkrankheiten (Pflanzenpathologie) und Pflanzenschutz**, **66** (9), 572–582.

In pots of soil infested with *Heterodera rostochiensis* Stelter & Raeuber grew the susceptible cultivated potato variety Aquila and one susceptible and three resistant crosses of cultivated varieties with *Solanum tuberosum andigena* (C.P.C.1673). The changes in cyst numbers in the soil were traced throughout the duration of the experiment (May 31st to September 18th). Virtually no change in cyst numbers occurred with the resistant crosses, but increasing numbers of cysts were found, from mid-July onwards, in the pots carrying susceptible plants. Numbers of larvae per cyst and per gramme of soil fell initially in all cases and continued to decrease in the case of resistant crosses, but increased again, in August and September, in the pots carrying susceptible plants. The final levels of larvae per gm. of soil, expressed as a percentage of the initial level, were 657 for Aquila, 134 for the susceptible cross, and 16, 14 and 11 for the resistant crosses. The results are presented both in tabular and graphical form and given detailed statistical treatment. R. D. Winslow

472—TANAKA, I., 1957. [Kagoshima Tobacco Experiment Station, Kagoshima, Japan.] [Resistance of tobacco seedlings to root-knot nematodes.] **Kyushu Agricultural Research**, No. 19, pp. 67–68. [In Japanese.]

Tabaka tried to find the differences between tobacco varieties susceptible and resistant to the root-knot nematode in the number and development of larvae invading the root. Within 10 days of germination, 10 larvae were found to have invaded the resistant variety RK 70, while 85 had invaded the susceptible variety Bright Yellow. Numbers of galls per plant were 1.2 to 4.0 and 47.0 to 89.0 respectively. M. Ichinohe

473—WADE, A. E., 1960. [University of Florida, U.S.A.] "Studies of the immune responses elicited by the lungworm parasite *Dictyocaulus viviparus* (Bloch)." **Dissertation Abstracts**, **20** (7), 2847–2848.

474—WILSON, L. O., 1960. [Illinois College of Veterinary Medicine, Urbana, Illinois, U.S.A.] "Immunity to parasitic infections." **Illinois Veterinarian**, **3** (2), 60–64.

Wilson very briefly reviews some aspects of immunity to parasites such as the existence of different types of antigens, resistance to reinfection, passive transfer of immunity and artificial immunity in *Trichinella spiralis*, self cure in *Haemonchus contortus*, age resistance, and the existence of passive and of early and late immunity in cestode infections. G. I. Pozniak

- 475—WINSTEAD, N. N., 1959. [Dept. of Plant Pathology, North Carolina State College, Raleigh, North Carolina, U.S.A.] "Reaction of cabbage varieties and clubroot-resistant lines to root-knot nematodes." **Plant Disease Reporter**, **43** (12), 1280-1281.

Winstead tested 11 cabbage varieties and lines for susceptibility to *Meloidogyne incognita*, *M. incognita* var. *acrita*, *M. arenaria*, *M. javanica* and *M. hapla*. Five of the lines were club-root resistant. No resistance to any nematode species was shown by any of the cabbage varieties or lines although they were generally less severely affected by *M. hapla* and slightly less so by *M. arenaria* than by the other species. There appears to be no correlation between resistance to club-root and to root-knot. It is suggested that either the factors causing root swelling produced by the two parasites are different, or that the factors for resistance to club-root are unrelated to gall formation.

M. T. Franklin

- 476—YAMANAKA, T., 1958. [Department on Parasitology, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [An immunological study on *Gnathostoma spinigerum*.] **Igaku Kenkyu. Fukuoka**, **28** (7), 2043-2076. [In Japanese: English summary pp. 2074-2076.]

Shwartzman's & Arthus' phenomena were produced in guinea-pigs by an extract made from whole third-stage larvae of *Gnathostoma spinigerum*, obtained from *Ophicephalus argus*. The protein and the saccharide fractions of the extract produced Shwartzman's phenomenon of equal intensity. Arthus' phenomenon provoked by the protein fraction at the site of injection was, however, more intense and enduring than that elicited by the saccharide fraction. The sera from patients with gnathostomiasis, previously diagnosed by their skin reactions, were all positive to Prausnitz-Küstner's reaction. A passive transfer of gnathostome allergy to non-infected guinea-pigs was successful by sera from the patients with gnathostomiasis and from artificially infected rabbits. The guinea-pigs sensitized with the larval extract underwent a lethal anaphylactic shock when the extract was given intravenously three weeks after the initial administration. In experimental gnathostomiasis, the first positive reactions to the skin test were observed 20 days later in rabbits, and 10 days later in guinea-pigs.

Y. Yamao

Anthelmintics

- 477—BERESLAVICH, T. N., 1959. [Rostovsk-na-Donu respublikanski nauchno-issledovatel'ski institut malyarii i meditsinskoi parazitologii, Ministerstvo zdравookhraneniya RSFSR, U.S.S.R.] [The treatment of trichuriasis.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, **28** (5), 618. [In Russian.]

Several treatment regimes were tried against trichuriasis with the following results: 100 patients received hexylresorcinol after a preliminary application of gentian violet or methylene blue and of 75 followed up 25.3% became cured; of 252 patients treated with heptylresorcinol alone or followed by yatren or purgen, 35.6% of the 174 followed up were cured; oxygen enemas for five days before the heptylresorcinol raised the efficacy to 54.6%; of 118 patients given aminarsone [carbarsone] (0.25 gm. four times daily before meals for five days, followed by purgen or yatren for three days) 80 were followed up and 33.8% of these were cured. Emetine, ditrazine, hexachlorethane and *Hypersicum* preparations proved ineffective.

G. I. Pozniak

- 478—CHOU, H. C. & HUANGFU, M., 1960. [Chiahhsing Antischistosomiasis Institute, Chiahhsing, Chekiang, China.] "Pumpkin seed (*Cucurbita moschata*) in the treatment of acute schistosomiasis." **Chinese Medical Journal. Peking**, **80** (2), 115-120.

Schistosomiasis in 89 patients was treated with 80 gm. of powdered pumpkin seeds, taken three times daily for one month. The only side reactions were indigestion and diarrhoea. Marked alleviation of symptoms was achieved, although only 7 of the 31 cases followed up were cured. The curative effect could be raised by small daily additions of potassium antimony tartrate.

G. I. Pozniak

- 479—COLGLAZIER, M. L., ENZIE, F. D., FOSTER, A. O. & THOMPSON, D. E., 1959. [Animal Disease and Parasite Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "The efficacy of piperazine citrate and phenothiazine against *Heterakis gallinae* and *Ascaridia galli* in chickens." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 57.

- 480—DELAČ, M. & MARŽAN, B., 1959. [Zavod za farmakologiju Veterinarskog fakulteta Sveučilišta u Zagrebu, Yugoslavia.] "Suzbijanje fascioleze u ovaca intramuskularnom aplikacijom tetraklorometana (carboney tetrachloridum)." **Veterinarski Arhiv**, 29 (11/12), 357–362. [English & French summaries p. 362.]

18 sheep, in three of which the faeces were negative, were treated against fascioliasis with carbon tetrachloride. The drug was administered intramuscularly, either pure (3 c.c.) or mixed in the ratio 3:1 with liquid paraffin (4 c.c.). The treatment gave encouraging results but local necrosis appeared as a persistent side effect. Hepatic lesions corresponded to those encountered in the case of subcutaneous application of the drug.

N. Jones

- 481—DRUDGE, J. H., LELAND, Jr., S. E., WYANT, Z. N., ELAM, G. W. & HUTZLER, L. B., 1960. [Dept. of Animal Pathology, Kentucky Agricultural Experiment Station, Lexington, Kentucky, U.S.A.] "Field studies comparing piperazine-carbon disulfide complex with carbon disulfide for parasite control in the horse." **American Journal of Veterinary Research**, 21 (82), 397–402.

In suckling foals, piperazine-carbon disulphide complex at 0.25 oz. per 100 lb. body-weight (10 mg. piperazine base per lb.) was superior to carbon disulphide for the control of ascarids, although 0.5 oz. per 100 lb. is recommended for the most effective control. In weanlings and yearlings both the carbon disulphide and the piperazine complex were equally effective against both mature and immature ascarids.

P. L. Thomas

- 482—FROMUNDA, V., 1959. "Cercetări privind dehelmintizarea pe grupe a porcilor contra ascaridiozei cu un nou antihelmintic: silicofluorura de sodiu." **Lucrările Științifice ale Institutului de Patologie și Igienă Animală. Bucharest**, Year 1958, 9, 333–344. [French and Russian summaries pp. 343–344.]

Fromunda administered sodium silicofluoride to 1,298 pigs infected with ascarids; the chemical was given in semi-liquid food as six doses within two days. Each dose consisted of 0.5 gm. for animals under 40 kg. and of 0.7 gm. for those over. The quantity of food was reduced during the two days' treatment. Therapeutic efficacy varied in different groups of animals between 78.8% and 100% as controlled by faecal and post-mortem examinations. In all cases there was disappearance of clinical symptoms and greater increase in weight. No side effects were observed.

N. Jones

- 483—FUJITA, K., 1959. [Department of Parasitology, School of Medicine, Keio University, Tokyo, Japan.] [Studies on the ovicidal effects of various agricultural chemicals on *Ascaris* eggs. 1. Experiments in vitro.] **Japanese Journal of Parasitology**, 8 (4), 580–585. [In Japanese: English summary p. 585.]

The ovicidal effect of 22 chemical compounds mainly of agricultural use, was examined against eggs obtained from the uteri of pig *Ascaris* in vitro, at 28°C. More than 80% ovicidal effectiveness was shown by D.D.T., chlorthion (3-chloro-4-nitrophenyl dimethyl thiophosphate), isochlorthion (2-chloro-4-nitrophenyl dimethyl thiophosphate), pentachlorophenol, Sappiran (p-chloro-p-chlorobenzene sulphonate), Koromite (4-dinitrocyclohexyl phenolacetate) and cresol-soap solution, after 12 to 18 days immersion in 1 : 1,000 dilution. 1 : 2,000 dilution of chlorthion, isochlorthion, pentachlorophenol, Koromite and cresol-soap, and 1 : 4,000 dilution of pentachlorophenol, Koromite and cresol-soap had the same effect. Among the effective compounds, chlorthion and pentachlorophenol worked very quickly, D.D.T. and Sappiran rather slowly, isochlorthion and Koromite moderately.

Y. Yamao

- 484—FUNNIKOVA, S. V., 1959. [Otdel gelmintologii, Kazanski nauchno-issledovatel'ski veterinarni institut, U.S.S.R.] [Experimental treatment of setariasis of horses with antimony compounds.] **Trudi Kazanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, No. 13, pp. 428–438. [In Russian.]

Setaria equina larvae were immobilized after two to five hours in 6% to 0.1% solutions of tartar emetic. In a 0.001% solution of this compound and in 6% to 0.001% solutions of Solusurmine, immobilization occurred after 22 hours. 2% tartar emetic was injected intravenously in three consecutive daily doses of 100 ml. each to 47 horses with setariasis (in five of these horses *Onchocerca cervicalis* infection was also established). Treatment resulted in a complete cure of nearly half of the animals and in a reduction of the intensity of infection to a quarter of its previous level in the others. Solusurmine administered intravenously to one horse, in five consecutive daily doses of 100 ml. and at concentrations ranging from 2% to 17% caused a reduction of the number of larvae from 33 to 2 per ml. of blood six days after the beginning of treatment, but failed to produce a satisfactory effect against adult parasites. N. Jones

- 485—HSÜ, J. K. ET AL., 1960. [Institute of Parasitic Diseases of the Academy of Medical Sciences, Shanghai, China.] "Sodium antimony dimercaptosuccinate (Sb-58) in treatment of schistosomiasis japonica." **Chinese Medical Journal. Peking**, 80 (6), 530–537.

567 patients with either latent or advanced *Schistosoma japonicum* infection were treated with sodium antimony dimercaptosuccinate (Sb-58) given intramuscularly as a 10% aqueous solution. The total doses were 30 mg. to 40 mg. per kg. body-weight given for three days, or 45 mg. to 60 mg. per kg. for 12 days. The principle side effects were gastro-intestinal disturbances, dizziness, headache and rise in temperature which appeared to be directly related to the dosage; gastro-intestinal disturbances were related to the number of applications. Four of the patients died, three from side effects. The effect on ECG tracings was the same as that produced by tartar emetic. Efficacy was in the order of 100% to 59.9%, starting from the 12th day up to six months after treatment. It was shown that Sb-58 is not inferior to tartar emetic and that with Sb-58, at a large dosage within the range of tolerance, a greater quantity of antimony remains in the blood and for longer than with tartar emetic. N. Jones

- 486—HUANG, M. H. ET AL., 1960. [Shanghai Second Medical College, Shanghai, China.] "Cardiac arrhythmias in tartar emetic intoxication." **Chinese Medical Journal. Peking**, 80 (4), 319–323. Huang *et al.* review recent work done in China on tartar emetic intoxication in treatment of schistosomiasis. As a result of improved methods of application, mortalities due to antimony intoxication have fallen from 0.4% in 1950 to 0.005% in 1958. The most frequent cause of mortality is cardiac arrhythmia, and its mechanism and prevention are discussed.

G. I. Pozniak

- 487—ISHIHARA, T., 1957. [National Institute of Animal Health, Kodaira, Tokyo, Japan.] [Studies on absorption and distribution of a piperazine derivative (1-diethylcarbamyl-4-methylpiperazine citrate).] **Bulletin of the National Institute of Animal Health. Tokyo**, No. 33, pp. 145–158. [In Japanese: English summary pp. 156–158.]

A piperazine derivative level in the serum reached its peak within an hour after medication and fell suddenly several hours after it reached the peak. Absorption and excretion of the piperazine derivative was rapid in horses, slow in goats and intermediate in cattle. The piperazine derivative remained in brains and muscles longer and in higher concentrations than in sera. A dose of 10 mg. per kg. body-weight of the piperazine derivative was given to cattle three times a day for two days. This was effective against all stages (adults, larvae and microfilariae) of *Setaria cervi* (synonym *S. digitata*). Y. Yamao

- 488—JIMÉNEZ-QUIRÓS, O. & ZAMORA, L., 1959. [Cátedra de Helminología, Facultad de Microbiología y Sección de Salud del D.B.O., Universidad de Costa Rica.] "Parasitosis intestinal en el universitario costarricense. III. Terapéutica." **Revista de Biología Tropical. Universidad de Costa Rica**, 7 (1), 95–106. [English summary p. 105.]

After testing a number of anthelmintics on 2,000 male and female students at the University of Costa Rica, many of whom were suffering from *Trichuris trichiura* infection, the following

were selected by reason of efficacy, tolerance and low cost: hexylresorcinol, tetrachlorethylene (either alone or combined with chenopodium), latex of *Ficus glabratus*, dithiazanine, piperazine, β (4-hydroxy-3, 5-diiodophenyl)- α -phenyl-propionic acid, and diphenthane-70. Side effects and contra-indications are given for each.

W. K. Dunscombe

489—JORDAN, H. E., 1960. [Department of Pathology and Parasitology, School of Veterinary Medicine, University of Georgia, Athens, Georgia, U.S.A.] "Evaluation of cyanacethydrazide for removal of lungworms from naturally infected sheep. **Journal of the American Veterinary Medical Association**, **136** (10), 508–510.

Four groups of sheep were used for evaluating the efficiency of cyanacethydrazide for clearing *Dictyocaulus filaria* infection. One group acted as controls, one received subcutaneous injections of 250 mg. per 35 lb. body-weight on three consecutive days and showed 92.4% clearance, and another group received one dose of 250 mg. per 35 lb. body-weight and showed 86.7% clearance. The fourth group received one oral dose of 250 mg. per 35 lb. body-weight and 77.3% were cleared. Coughing ceased in the treated animals.

K. Heath

490—KHEN, B. G., 1960. [Institut meditsinskoi parazitologii i tropicheskoi meditsini imeni E. I. Martosinskogo, Ministerstvo zdavookhraneniya SSSR.] [The elimination of ancylostome eggs and larvae from faeces and soil by chemicals used as fertilizers.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, **29** (1), 96–98. [In Russian.]

Khen studied the action of ammonium nitrate, ammonium sulphate and potassium chloride on the eggs and larvae of *Necator americanus*. The experimental concentrations were 1 kg., 0.5 kg., 0.25 kg. and 0.1 kg. per cu.m. in the case of soil and faeces, and for faeces also concentrations of 5 kg., 3 kg., and 1 kg. per cu.m. were tried. The preliminary results showed that: (i) in sterile soil the development of almost all larvae is completed within five days, whereas in faeces a small number of first-stage and the second-stage larvae do not appear before two weeks; (ii) ammonium nitrate had the best effect, then ammonium sulphate, while potassium chloride had a comparatively weak effect; (iii) mixing the chemicals and their solutions with faeces was more effective than sprinkling them on the surface; (iv) ammonium nitrate at concentrations of 1 kg. and 0.25 kg. per sq.m. of faeces without urine achieved complete sterilization of eggs in three and five days respectively, while the first dose (1 kg.) sterilized the soil within two days; (v) deformation of the embryo was observed three days after the application of the 0.25 kg. dose of ammonium nitrate; (vi) the length of time needed for the development of *Necator* eggs did not appear to be influenced by the presence or absence of animal charcoal and sand; and (vii) the experimental chemicals were not observed to repel the larvae of the parasite.

N. Jones

491—KOBAYASHI, S., OISHI, I. & KUME, S., 1958. [School of Veterinary Medicine, Tokyo University of Agriculture and Technology, Fuchu, Tokyo, Japan.] [Experiments on the effect of piperazine sulphate on canine filariasis.] **Journal of the Japan Veterinary Medical Association**, **11** (12), 585–587. [In Japanese.]

Dogs with canine filariasis were treated with piperazine sulphate, 192 mg. per kg. body-weight, three times a day for seven days. No effect was observed on adults or microfilariae. *Toxocara* was effectively removed by one dose of 200 mg. per kg. of piperazine sulphate and no serious side effect was noted.

Y. Yamao

492—KOMIYA, Y. ET AL., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [The anthelmintic effect and the side reactions of 4-iodo-thymol preparation for ancylostomiasis and examination on the ratio of the negative for hookworm ova after administration of the chemical.] **Japanese Journal of Parasitology**, **8** (5), 835–842. [In Japanese: English summary p. 842.]

Mass treatment for ancylostomiasis was carried out at a junior high school in Saitama Prefecture, using 4-iodo-thymol as an anthelmintic. A follow-up study was carried out to determine the effectiveness of the treatment. Various ratios of the negative for ova were obtained,

ranging from 93.1% as the highest to 35.6% as the lowest, according to the method employed. The lowest value seemed to be the closest to the real ratio of the negative for ova. In view of the possibility of false negatives, higher values should be regarded with caution.

Y. Yamao

- 493—KROTOV, A. I., 1960. [Otdel gelmintologii, Institut meditsinskoi parazitologii i tropicheskoi meditsini imeni E. I. Martsinovskogo, Ministerstvo zdравookhraneniya SSSR.] [A study of and search for ascaricides.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni**. Moscow, 29 (1), 92–96. [In Russian: English summary p. 96.]

Krotov briefly reviews the research on ascaricides carried out at the Medical Parasitology and Tropical Diseases Institute of the Ministry of Public Health of the U.S.S.R. from 1952 to 1958. Anti-ascarid remedies are divided into four principal groups, namely: (i) protoplasmic poisons; (ii) remedies irritating the nervous system and causing convulsive contractions in ascarids; (iii) remedies acting on enzyme reactions; and (iv) proteolytic ferments. The author goes on to discuss methods of combined therapy which employ data on the physiology of *Ascaris* and on the mechanism of action of different anthelmintics, in order to achieve better results.

N. Jones

- 494—KUNII, Y., 1959. [Laboratory of Nematology, Kanto-Tosan Agricultural Experiment Station, Chiba, Japan.] [Studies on the ovicidal effect of mustard oil. 4. Influence of temperature upon the ovicidal effect of mustard oil.] **Japanese Journal of Parasitology**, 8 (4), 575–579. [In Japanese: English summary p. 579.]

Ovicidal effects of phenyl and tolyl mustard oil against normal eggs in the uterus of pig ascarids, *Ascaris lumbricoides*, were examined at 28°C., 20°C., 17°C., 15°C., 9°C., 5°C., 1°C., and –7°C. Tolyl mustard oil was completely effective in 1 : 1,000 dilution at all these temperatures. The effective ovicidal temperature of mustard oil was about 15°C. in a seven-day treatment; the temperature should be raised above this as the period of treatment is shortened. The effective ovicidal temperature of mustard oil was somewhat related to the development of *Ascaris* eggs.

Y. Yamao

- 495—McCOWEN, M. C., GOSSETT, F. O., CALLENDER, M. E. & BRANDT, M. C., 1960. [Lilly Research Laboratories, Indianapolis, Indiana.] "Effect of hygromycin B on nematodes." **Veterinary Medicine**, 55 (6), 85–89.

Hygromix containing 6,000 units per lb. of complete feed was fed to pigs and was very effective against *Oesophagostomum* spp. and *Trichuris suis* when fed *ad lib.* to weanling pigs for 42 days. The pigs gained well and a reduction in the number of *Ascaris lumbricoides* was also seen. In experiments with breeding gilts it was shown that 30,000 and 45,000 units of hygromycin per gilt in 5 lb. of complete feed effectively removed the *Oesophagostomum*. If the hygromycin was given as 30,000 units per half-pound of protein supplement fed as free choice it was less effective than when given in the complete feed. However, 45,000 units per half-pound supplement was effective as an anthelmintic.

K. Heath

- 496—MARQUARDT, W. C., FRITTS, D. H., McALPIN, N. R. & HAWKINS, Jr., W. W., 1960. [Montana Veterinary Research Laboratory, Montana State College, Bozeman, Montana, U.S.A.] "The activity of bephenium embonate against the free-living and adult stages of *Nematodirus spathiger*." **Journal of Parasitology**, 46 (1), 42.

The effect of bephenium embonate was tested against *Nematodirus spathiger*, *N. filicollis*, *Trichostrongylus colubriformis*, *T. axei*, *Ostertagia circumcincta*, *Marshallagia marshalli* and *Haemonchus contortus* infection in lambs. The lambs were all naturally infected and were dosed with bephenium embonate administered orally at levels of 250 mg. per kg. body-weight. The results show that the drug is effective against *N. filicollis* and *N. spathiger* and has some effect against *T. axei*, *H. contortus* and *M. marshalli*, but has no effect on the free-living stages of *N. spathiger*.

K. Heath

- 497—MATSUMOTO, S. & KURAMOTO, M., 1957. [Fuji Chemical Industry Co. Ltd., Japan.] [The ovicidal activity of organic sulphur compounds. Studies on the ovicide against the ascarid, *Ascaris lumbricoides*.] **Botyu-Kagaku. Kyoto**, 22 (4), 333–339. [In Japanese: English summary p. 339.]

Complete ovicidal effect of allyl-isothiocyanate against the eggs of *Ascaris lumbricoides* in vitro was obtained at a concentration of 10^{-4} to 2×10^{-4} in aqueous emulsion form and 5×10^{-3} in a urine medium. Some organic compounds which had the general chemical formula as $R-N=C=S$ were most effective as ovicides in the direct contact method. Matsumoto & Kuramoto postulate that the radical $-N=C=S$ has an intimate interaction with the metabolism of *Ascaris* eggs which may effect the inhibition of growth. They also state that the selection of the organic solvents and emulsifiers was most important, the emulsion concentrate formula being most effective.

Y. Yamao

- 498—MAYHEW, R. L. & LANK, B. B., 1959. [Louisiana State University, U.S.A.] “Results of a few experiments using phenothiazine, copper sulphate and nicotine sulphate as anthelmintics in cattle.” [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 46–47.

- 499—NAGANO, R. & ITO, S., 1957. [Kyushu Agricultural Laboratory, Japan.] [The efficacy of Hinetol (gentian-violet) in removing *Strongyloides ransomi* of swine.] **Kyushu Agricultural Research**, No. 19, 109–110. [In Japanese.]

Seven baby pigs, six days old, in which infection with *Strongyloides ransomi* had been confirmed, were given one capsule of Hinetol, containing 0.2 gm. of gentian violet, three times a day for two days. Two to five days after the treatment faecal examinations became negative. Severe diarrhoea developed on the first day of the treatment but this had almost subsided five days after the end of treatment.

Y. Yamao

- 500—NAGANO, R. & ITO, S., 1958. [Kyushu Agricultural Laboratory, Kyushu, Japan.] [The efficacy of Hinetol (gentian violet) for removing *Strongyloides ransomi* of swine (supplement).] **Kyushu Agricultural Research**, No. 20, pp. 178–179. [In Japanese.]

Considering the side effects, the optimum dose of Hinetol seemed to be two capsules, each of 0.2 gm. of gentian violet, per day for two days for a baby pig and one capsule per day for a suckling.

Y. Yamao

- 501—NAGANO, R. & ITO, S., 1958. [Kyushu Agricultural Laboratory, Japan.] [The efficacy of piperazine for removing *Ascaris suilla* of swine. 1.] **Kyushu Agricultural Research**, No. 20, 179–180. [In Japanese.]

Pigs, infected with *Ascaris*, were treated with piperazine phosphate at 200 mg. per kg. body-weight for two days or 300 mg. per kg. for one or two days. Faeces became negative for eggs two days after treatment. The expulsion rate of the worms was assumed to be 100%. When pigs were treated with piperazine sulphate, at 112 mg. per kg. for one day, a considerable number became negative by faecal examination. The actual expulsion of the worms, however, was not confirmed. *Strongyloides ransomi* and *Oesophagostomum dentatum* were not affected by the treatment.

Y. Yamao

- 502—NAGANO, R. & ITO, S., 1959. [Kyushu Agricultural Laboratory, Japan.] [The efficacy of piperazine for removing *Ascaris suilla* of swine. 2.] **Kyushu Agricultural Research**, No. 21, pp. 215–216. [In Japanese.]

300 mg. per kg. body-weight of piperazine sulphate was given to pigs harbouring *Ascaris*. All the cases were negative on faecal examination after treatment, but the actual worm elimination rate was proved to be 50%. The same dose given once a day for two consecutive days was 100% effective as assessed by faecal examination and actual expulsion of the worms. 500 mg. per kg. in a single dose produced an 88% cure rate as assessed by faecal examination

and 100% elimination of worms. Piperazine sulphate had no serious side effects in these experiments, but was almost ineffective against *Strongyloides ransomi* and *Oesophagostomum dentatum*. Y. Yamao

- 503—NAKABAYASHI, T., 1959. [Department of Parasitology, Research Institute for Microbial Diseases, Osaka University, Osaka, Japan.] [On the increase or decrease of microfilaria of dog filaria, *Dirofilaria immitis*, by diethylcarbamazine.] **Japanese Journal of Parasitology**, 8 (5), 696–701. [In Japanese: English summary p. 701.]

The effects of diethylcarbamazine on microfilariae of *Dirofilaria immitis* were investigated; the numbers of microfilariae in the peripheral blood of infected dogs were counted after the oral or subcutaneous administration of supatonin (1-diethylcarbamyl-4-methylpiperazine citrate) or hetrazan (hydrochloride of the same). An obvious increase of microfilariae after the oral or subcutaneous administration of supatonin at 20 mg. per kg. body-weight or less was observed, but there was a marked decrease after the subcutaneous injection of 50 mg. per kg. or more. With hetrazan, no remarkable change in the microfilarial count was found. The effectiveness of diethylcarbamazine reached its peak after five to ten minutes and was maintained for about one hour. The decrease effect was sustained over two hours immediately after administration, and was related to a rapid increase in supatonin concentration in the blood. The number of microfilariae in the liver two hours after a subcutaneous injection of supatonin at 100 mg. per kg. was about 2·4 times more than before the injection. Y. Yamao

- 504—OKABE, K., SHIMOMURA, M. & TANAKA, T., 1959. [Department of Parasitology, Kurume University School of Medicine, Kurume, Japan.] [Treatment of schistosomiasis japonica with antimony-a, a'-dimercapto-potassium succinate (TWSb) and follow-up by the urine and serum precipitation reactions.] **Journal of the Kurume Medical Association**, 22 (4), 1418–1424. [In Japanese: English summary pp. 1420–1424.]

Five patients suffering from schistosomiasis japonica were treated with TWSb, by injecting 0·03 gm. to 0·041 gm. per kg. body-weight intramuscularly, totalling 1·5 gm. to 2·28 gm. per person. All five were cured. During the following year faecal examinations and the urine precipitation were continuously negative and no recurrence was noted. The serum precipitation tests became negative one year after the treatment. Side effects of TWSb were not serious and it was well tolerated, although nausea, vomiting and headache were sometimes noted. Y. Yamao

- 505—OLTEANU, G., 1959. "Cercetări compative privind eficacitatea ditrazinului, a soluțiilor iodurate și a fenotiazinei solubilizate, în dictiocauloza ovină." **Lucrările Stiintifice ale Institutului de Patologie și Igiena Animala. Bucharest**, Year 1958, 9, 961–375. [French and Russian summaries pp. 373–375.]

In order to compare the efficacy of different treatments, dictyocauliasis was treated with intratracheal injections of aqueous iodine solution in 4,510 sheep and of soluble phenothiazine in 57 sheep and with subcutaneous injections of ditrazine phosphate in 758 sheep. The iodine concentrations ranged from 1·0 to 1·5 in 1,500 to 1·0 to 1·5 in 750. They were fairly well tolerated by animals in good condition and the efficacy ranged from 22·22% to 85%. Soluble phenothiazine cured 35·29% of animals and concentrations of 1·3 and 1·4 aqueous ditrazine phosphate solution reduced the incidence of infection by 74·37% and the degree of infection by 97%. The best therapy was found to be that of 0·1 gm. of ditrazine phosphate per kg. body-weight in subcutaneous injections repeated after 24 hours. In the case of animals in good condition, 1·0 to 1·5 in 1,500 concentrations of aqueous iodine solution can be injected in both lungs by changing the animal's position and without withdrawing the needle from the trachea. N. Jones

- 506—PIRINGER, W. A., LUQUE, J. M. & MEZEY, K. C., 1960. [Instituto de investigación científica del Lab. CUP, Bogotá, Colombia.] "Destruction of *Hymenolepis nana* eggs 'in vitro' by the action of various anthelmintic drugs." **Zeitschrift für Tropenmedizin und Parasitologie**, 11 (1), 51–56. [German & Spanish summaries p. 56.]

The eggs of *Hymenolepis nana* obtained from emulsified faeces were exposed to hexylresorcinol, ficin, papain, a substance with an acridilamino base, a substance with a quinoline base, piperazine and dithiazanine iodide. Hexylresorcinol was active at dilutions of 0·5% causing destruction

of the hyalino-proteinic substances by precipitation and at 0.03% by swelling and rupture of the membrane. Ficin and papain caused destruction at 0.5% concentration with swelling followed by rupture of the membrane. This process could be accelerated by incubation at 37°C. The other anthelmintic drugs were inactive.

K. Heath

507—PLOTNIKOV, N. N. & TURCHINS, M. E., 1960. [Institut meditsinskoi parazitologii i tropicheskoi meditsini imeni E. I. Martinovskogo, Ministerstvo zdravookhraneniya SSSR.] [Cyanine dyes in the treatment of some helminthiasis of man and animals. Review of the literature.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow**, 29 (1), 101–104. [In Russian.]

Plotnikov & Turchins, after having reviewed the literature on the use of cyanine dyes as anthelmintics, conclude that these substances, and especially dithiazanine, deserve more attention.

N. Jones

508—RICCI, M. & GAGLIANO, E., 1960. [Istituto Superiore di Sanità, Laboratori di Parassitologia, Roma, Italy.] “Note sull’azione antielmintica della ditiagianina.” **Rivista di Parassitologia**, 21 (2), 151–154. [English summary p. 153.]

Dithiazanine (Anelmid) was given in the prescribed dosage or in reduced doses to children. The children each harboured two to four of the following helminth species, *Hymenolepis nana*, *Ascaris lumbricoides*, *Enterobius vermicularis* and *Trichuris trichiura*. At the full dosage vomiting, abdominal pains and diarrhoea were observed but slightly reduced doses were in general well tolerated. The results of complete and incomplete treatments, as assessed 20 days later and which are tabulated, showed the efficacy to be 25% against *H. nana*, 63.16% against *A. lumbricoides*, 80% against *E. vermicularis* and 5% against *T. trichiura*.

N. Jones

509—RUBIN, R., 1959. [Colorado State University, U.S.A.] “The efficacy of cyanacethydrazide in calves experimentally infected with *Dictyocaulus viviparus*.” [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 57.

510—RUBIN, R., 1960. [College of Veterinary Medicine, Colorado State University, Fort Collins, Colorado, U.S.A.] “The effect of bephenium embonate on egg production in *Nematodirus helvetianus* and other gastrointestinal nematodes in cattle.” **American Journal of Veterinary Research**, 21 (81), 178–180.

In a non-critical experiment, bephenium embonate (given as oral doses of 39.9 gm. in gelatin capsules) reduced the faecal egg counts of calves infected with *Nematodirus helvetianus*, *Ostertagia orloffi* and *Cooperia oncophora* to zero in 9 out of 12 calves. The dose rate was approximately 250 mg. per kg. body-weight. Residual egg counts in the remaining three treated calves were negligible.

P. L. Thomas

511—SCHWARZ, F., 1957. [Tierärztliche Hochschule, Wien, Austria.] “Behandlungsversuche der Strongyloidose des Schweines mit ‘Strongitin’.” **Wiener Tierärztliche Monatsschrift**, 44 (9), 567.

Strongitin-Osip proved useful in a four-day application against *Strongyloides* in 64 pigs. Suitable therapeutic doses were 100 mg. for piglets aged up to 14 days, 200 mg. to 300 mg. for those aged over 14 days, 500 mg. to 1 gm. for weaned piglets and 1 gm. per 10 kg. body-weight for grown animals.

G. I. Pozniak

512—SELIVANOVA-YARTSEVA, A. S., 1959. [Phenothiazine as a prophylactic against *Amidostomum* infections in geese.] **Sbornik Nauchnikh Rabot Sibirskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta**, 8, 201–204. [In Russian.]

The data given in this paper are essentially the same as those published earlier in an author's abstract [for abstract see Helm. Abs., 24, No. 3080]. However, it is now stated that phenothiazine killed or stopped the development of *Amidostomum* eggs when it was present in the

faeces in proportions of 1:10 to 1:1,000, but that a 1:10,000 concentration killed only 0.7% to 5.5% of the eggs, the remainder developing to the second or third larval stage.

G. I. Pozniak

- 513—SHARAF, A., HAIBA, M. H. & SHIHATA, I. M., 1960. [Dept. of Pharmacology, Faculty of Veterinary Medicine, Cairo University, Cairo, Egypt.] “*In vitro* studies on the effect of some anti-malarial drugs on *Fasciola* worms in buffaloes, cattle, and sheep.” **American Journal of Veterinary Research**, 21 (81), 308–310.

The fact that the hepatic parenchyma is a habitat common to both *Fasciola* and pre-erythrocytic stages of plasmodia led the authors to consider anti-malarial drugs for control of fascioliasis. Atebrin, Camoquin, Daraprim and quinine sulphate were added to *Fasciola gigantica* suspended *in vitro* in oxygenated Tyrode's solution and the flukes' reactions recorded kymographically. All these substances stimulated motility but none killed the parasite. It is suggested that these drugs used *in vivo* in correct dosages may cause detachment of the flukes from the bile-ducts.

T. J. Coyle

- 514—STOICAN, E. & GALIN, G., 1959. “Eficacitatea antihelmintică a fenotiazinei administrată pegrupe mari de păsări, comparativ cu dehelmintizările individuale facute cu tetrachlorură de carbon, fenobent și filixonă.” **Lucrarile Stiintifice ale Institutului de Patologie si Igiena Animala**. Bucharest, Year 1958, 9, 377–384. [French & Russian summaries pp. 383–384.]

Stoican & Galin report on the results of treatment involving three groups of 250 chickens. Four doses of 1 gm. of phenothiazine per kg. body-weight given in food at intervals of 15 to 25 days, had an efficacy against *Ascaridia galli* and *Heterakis gallinae* of 83.5% and 83.2% respectively. Eight such doses had an efficacy of 100% against *Capillaria* sp. Administration of 1.5 ml. of carbon tetrachloride per kg. (synged into the crop), followed by 0.7 gm. of Phenobent and 0.15 gm. filixan per kg., administered *per os* 20 days later, had an efficacy of 75%, 62.7% and 15.9% respectively against *A. galli*, *H. gallinae* and *Capillaria* sp. It was found that 60 to 75 days after the last treatment the incidence of *A. galli* increased from 5% to 40% and that of *H. gallinae* from 11.7% to 36%. Green food in the diet of chickens slightly reduced the incidence of infection.

N. Jones

- 515—SUGURO, T., 1959. [Department of Parasitology, National Institute of Health, Tokyo, Japan.] [Experimental studies on the therapy of paragonimiasis. 2.] **Japanese Journal of Parasitology**, 8 (5), 725–739. [In Japanese: English summary p. 739.]

Experimental paragonimiasis of dogs was treated by several chemotherapeutic agents, the effectiveness of which was evaluated by the number of eggs in the faeces. 0.6 mg. to 0.64 mg. per kg. body-weight of emetine hydrochloride and 1.0 gm. of sulphadiazine were administered every other day for more than 100 doses; this was proved to be most effective without serious side effects. Ultra-short wave radiation applied 30 to 40 minutes per day for 95 days was also considerably effective.

Y. Yamao

- 516—TAREEVA, A. I., KROPACHEVA, A. A. & RABINOVICH, F. E., 1959. [Otdel farmakologii Vsesoyuzni nauchno-issledovatel'ski kliniko-farmatsevticheski institut, U.S.S.R.] [A comparative study of the anthelmintic properties of different piperazine salts.] **Meditinskaya Parazitologiya i Parazitarnie Bolezni**. Moscow, 28 (5), 591–594. [In Russian: English summary p. 594.]

The anthelmintic efficacy of 15 piperazine salts (proved anthelmintics and new compounds) was tested on cats infected with *Toxocara mystax*. The compounds are here listed in order of their water solubility, and the extense-efficacies [cure rate] and intens-efficacies [reduction of worm burden] obtained follow in brackets: sulphate (90% and 80.6%), malonate (50% and 37%), propionate (73% and 80.7%), nicotinate (85.7% and 86%), citrate (79% and 78%), dichlorohydrate (75% and 70%), phthalate (75% and 88%), trioxylglutarate (93.3% and 84.3%), diacetate (92.8% and 93.1%), benzoate (88% and 91%), diphenylacetate (90% and 92%), adipate (76% and 34%), phosphate (45% and 34%), salicylate (45.5% and 50%) and

stearate (70% and 90%). The efficacy of the compounds was not directly dependent on their insolubility, but on their piperazine content and, to a small degree, on the nature of the salt itself.

G. I. Pozniak

517—THOMAS, R. E. & JONES, L. P., 1960. [Old Ridge, Tennessee, U.S.A.] "Lungworm infection in the burro." *Veterinary Medicine*, 55 (5), 38–40.

Cyanacethydrazide has been examined for its activity against *Dictyocaulus arnfieldi* in the donkey. The drug was given either orally at a level of 17.5 mg. per kg. body-weight or by the subcutaneous route at 15.0 mg. per kg. 16 days after treatment a 50% reduction in the number of larvae excreted was demonstrated by the Baermann technique.

K. Heath

518—UENO, H., WATANABE, S. & FUJITA, J., 1959. [National Institute of Animal Health, Kokubunji, Tokyo, Japan.] [Studies on anthelmintics against the common liver-fluke. I. Action of four halogenated diphenylmethanes and three diphenylsulphides.] *Journal of the Japan Veterinary Medical Association*, 12 (7), 297–301. [In Japanese: English summary p. 301.]

Four different kinds of diphenylmethane compounds and three types of diphenylsulphides were examined for their effect on rabbits experimentally infected with *Fasciola*. Bithionol (2,2'-dihydroxy-3,3',5,5'-tetrachlorodiphenyl sulphide) was found to be the most effective. 75 mg. per kg. body-weight of bithionol, given orally in a single dose almost completely expelled the parasite from the sheep without any side effects. Against the young worms in tissues, however, 200 mg. per kg. of bithionol was ineffective in rabbits and a 75 mg. per kg. dose was also ineffective in sheep.

Y. Yamao

519—WIKERHAUSER, T., ŽUKOVIĆ, M., VRAŽIĆ, O., RICHTER, S. & MAŽGON, Ž., 1959. [Zavod za parasitologiju i nametničke bolesti Veterinarskog fakulteta u Zagrebu, Yugoslavia.] "O djelovanju cijanacethidrazida u liječenju diktiokauloze ovaca i metastrongilidoze svinja." *Veterinarski Arhiv*, 29 (11/12), 363–368. [English & French summaries pp. 367–368.]

Two groups of eight sheep harbouring *Dictyocaulus filaria* received respectively three and two therapeutic doses of cyanacethydrazide. The drug was administered subcutaneously in the first group and orally in the second, while a third group of 11 sheep served as controls. Some of the animals also harboured *Protostrongylus* and *Muellerius*. The average number of *D. filaria* per animal, recovered from four of the first group, six of the second and seven of the third, 48 days after the beginning of the treatment was 20, 84 and 93 respectively. The number of other parasite species was approximately the same in all three groups. In the second experiment 15 sheep received three consecutive daily therapeutic doses of the drug and three others remained as controls. The mean number of *D. filaria* recovered at post-mortem examinations 11 to 17 days after the beginning of the treatment was 1.6 and 41.2 per animal in the treated and untreated group respectively. In further experiments a total of 93 pigs were treated subcutaneously with cyanacethydrazide against metastrongylosis. Some of the pigs also had ascariasis, which was treated with either piperazine or sodium fluoride. Five other pigs served as controls. Two of the treated animals received an increased dose (by 50%) of the drug. The others received therapeutic doses two to three times daily. Subsidence or disappearance of cough, increase of appetite and increase in weight gain were the results of the treatment but the worm burden remained high. In the two animals that received the increased dose, anorexia, shivering and parenchymatous degeneration of the liver were observed.

N. Jones

520—WOOD, I. B., EMRO, J., WALLACE, W. S. & WALETZKY, E., 1959. [Agricultural Division, American Cyanamid Company, Pearl River, New York, U.S.A.] "The effects of Caricide, diethyl-carbamazine, on experimental infections of *Haemonchus contortus* and *Trichostrongylus* spp. in lambs." [Abstract.] *Journal of Parasitology*, 45 (4, Sect. 2), 56.

- 521—WORLEY, D. E. & HANSEN, M. F., 1960. [Dept. of Zoology, Kansas State College, Manhattan, U.S.A.] "Chemotherapeutic studies of gastrointestinal parasites of beef cattle and bison in Kansas." *American Journal of Veterinary Research*, **21** (82), 416-421.

In field trials in which chlortetracycline, phenothiazine, diethylstilboestrol, alone or in various combinations, were given as feed additives to beef cattle, none were effective alone, but 75 mg. of chlortetracycline plus 2 gm. of phenothiazine per animal per day significantly lowered the egg counts. Dowco 109, 0-4 (tert. butyl-2-chlorophenyl) 0-methyl methylphosphoramidothioate, at 15 mg. per kg. body-weight was ineffective. Ronnel given at 110.0 mg. per kg. as a single dose to bison gave an 83% reduction in egg count. The infections were all naturally acquired being predominantly *Cooperia*, *Trichostrongylus* and *Ostertagia* spp. P. L. Thomas

- 522—ŽUKOVIĆ, M. & WIKERHAUSER, T., 1960. [Zavod za parazitologiju i nametničke bolesti Veterinarskog fakulteta Sveučilišta u Zagrebu, Yugoslavia.] "Prilog poznavanju djelovanja derivata piperazina na askaride konjaisvinja." *Veterinarski Arhiv*, **30** (3/4), 65-70. [English and French summaries pp. 69-70.]

Žuković & Wikerhauser tested the adipate, citrate and phosphate of piperazine in the treatment of ascarid infections in 40 horses. Single doses of 0.15 gm. and 0.2 gm. per kg. body-weight were administered by oesophageal tube, in food or in equal parts with sugar. Food was withdrawn eight hours before and until three hours after treatment. No significant difference was observed in the efficacy of the different drugs which, as estimated on the total number of animals treated and examined eight to ten days after treatment, was 92.5%. In a further experiment 0.2 gm. and 0.3 gm. per kg. of piperazine adipate and phosphate were either intubated or given in food in single doses to 56 pigs two to five months old. Faecal and post-mortem examinations showed that the efficacy of the smaller dose was 64.86% and of the larger 84.21%. In another field experiment 313 pigs, average weight 25 kg. and 32 kg., were treated for ascarids with 0.3 gm. per kg. of either piperazine adipate or phosphate, given in food to groups of 20 animals after 12 hours' starvation which was continued for two to three hours after treatment. Efficacy of the treatment, estimated on the total of experimental animals, was 77.5%. Weight gain also increased due to the treatment. N. Jones

Economic Aspects

- 523—GEMMELL, M. A. & BRYDON, P., 1960. [Hydatid Research Unit, New Zealand Medical Research Council, University of Otago Medical School, Dunedin C.1, New Zealand.] "Hydatid disease in Australia. V. Observations on hydatidiasis in cattle and pigs in New South Wales and the economic loss caused by the larval stage of *Echinococcus granulosus* (Batsch 1786) (Rudolphi 1801) in food animals in Australia." *Australian Veterinary Journal*, **36** (3), 73-78.

In non-sheep raising coastal districts of New South Wales two different incidences of *Echinococcus granulosus* are recorded in the livers of cattle. In sparsely populated regions where a dingo-wallaby hydatid cycle exists, the incidence of cysts in the livers of cattle varied from 12% in cattle of less than three years to 46.6% in animals over five years of age. In closely settled dairy districts where dingoes were absent the incidence was only 5.2% in the livers of old animals. The incidence of *E. granulosus* in pig livers varied from 1.4% in animals of less than six months to 10% in animals two to four years of age. The authors consider the economic loss from carcass and offal condemnation solely on account of hydatid does not exceed £600,000 annually in Australia. M. A. Gemmell

- 524—SMITH, H. E. ET AL., 1960. "Reduction in yield of cotton caused by diseases in 1959." *Plant Disease Reporter*, **44** (3), 189.

Smith *et al.* include root-knot nematodes, *Meloidogyne* sp., in a table giving the estimated reduction in yield of cotton due to various diseases in 1959. The estimated percentage loss is given for each State. The total loss caused by root-knot for the U.S.A. is estimated at 193,050 bales or 1.13% of the crop. D. J. Hooper

History

- 525—ALLAN, D. & JOHNSON, A. W., 1960. "A short history of husk." **Veterinary Record**, 72 (3), 42–45.

The authors review the literature on husk from the Greek and Roman literature to the present day. K. Heath

- 526—CERQUEIRA FALCÃO, E. DE, 1957. [C. Postal 796, Santos, São Paulo, Brazil.] "Novas achegas ao estudo da determinação da especificidade do '*Schistosomum mansoni*'." **Santos, São Paulo**: 211 pp.

Following his editorship of a commemorative volume on the occasion of Pirajá da Silva's 80th birthday in 1953, Falcão has now printed and issued privately a second volume reproducing, with Portuguese translations, a number of private letters of comment, commendation and criticism received by Pirajá da Silva during his investigations on *Schistosoma mansoni* in Bahia and written by Blanchard, Looss, Manson, Brumpt, Leiper, Henry, Lutz and others between 1909 and 1916. An account is also given of the speeches made on the presentation to Pirajá da Silva of the Bernhard Nocht Medal by the Tropeninstitut in Hamburg in 1954 in recognition of his researches. In a series of appendices there are reproduced: Pirajá da Silva's paper "Über einige Helminthen aus Bahia" from **Arch. Schiffs-u. Tropenhyg.**, 16, 1912 which was omitted from the Commemorative volume of 1953 (and now given also in Portuguese); Manson's original (1902) "Report of a case of Bilharzia from the West Indies" from **J. trop. Med.**, 5, and p. 613 from the 3rd edition (1903) of his book "Tropical Diseases"; Leiper's article (1916) "On the relation between the terminal-spined and lateral-spined eggs of Bilharzia" and an abstract of this article in the **Trop. Dis. Bull.**, 7, 347; pp. 301–302 of Brumpt's "Précis de Parasitologie", 1910 and pp. 387, 391 and 392 of the 3rd edition, 1922; these citations being intended to support Falcão's belief that Pirajá da Silva was the true discoverer of *Schistosoma mansoni* by describing the adults in 1908–09. R. T. Leiper

- 527—RASKI, D. J., 1959. "Historical highlights of nematology." In: Holton, C. S. et al. [Editors], "Plant pathology: problems and progress 1908–1958." **Madison: University of Wisconsin Press**, pp. 384–394.

Raski gives an historical account of the development of plant nematology from the first records in the 18th century to the present day, and discusses the chief problems which nematologists will have to face in the future. H. R. Wallace

Biography

No relevant abstracts in this issue

Hyperparasitism

- 528—STEWART, T. B. & GODWIN, H. J., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "A bacterial disease of *Ascaris suum*." [Abstract.] **Journal of Parasitology**, 45 (4, Sect. 2), 40–41.

- 529—WILLIAMS, J. R., 1960. [Sugar Research Institute, Réduit, Mauritius.] "Studies on the nematode soil fauna of sugarcane fields in Mauritius. 5. Notes upon a parasite of root-knot nematodes." **Nematologica**, 5 (1), 37–42. [French summary p. 42.]

Williams describes an organism, believed to be a sporozoan, parasitic in females of *Meloidogyne javanica* and *M. incognita* var. *acrita* from sugar-cane roots. In a survey 34% of the females were obviously infected. Infected females become filled with spores and are distinguished from healthy individuals by their milky white colour. The body contents are destroyed except for the oesophageal bulb. The spherical spores appear to be the final phase of the parasite

and it is assumed that they effect dispersal on escaping from the host. Other forms observed include ovoid bodies joined in various numbers by a central structure and apparently multiplying rapidly by production of buds on a dichotomously branched body. A third phase consists of ovoid cells with one to four nuclei and clear cytoplasm, in which nuclear division was observed but no cell division. It was not possible to determine the correct sequence of events in the life-cycle of the parasite.

M. T. Franklin

Evolution

530—EUZET, L., 1959. "Evolution du scolex chez les Onchobothriidae M. Braun (Cestoda—Tetraphyllidae)." **International Congress of Zoology** (15th), London, July 16–23, 1958. Proceedings, p. 675. [Discussion p. 675.]

Acanthobothrium Van Beneden appears to be the most primitive genus of the Onchobothriidae because it parasitizes the greatest number of selachian genera and especially *Heterodontus*. The scolex is formed of four bothridia, each divided into three loculi, and each with two Y-shaped hooks on a muscular cushion. Evolution in the Pleurotremata has resulted in a reduction in the number of loculi and in the Hypotremata has affected the hooks. In *Calliobothrium* (parasitic in Mustelidae) the hooks have split into two but the bases remain overlapping. *Spiniloculus mavensis* and *Yorkeria parva* do not fit into this scheme.

S. Willmott

531—OSHMARIN, P. G., 1958. "On the differentiation of the body of trematodes into motor and genital parts and on the phylogenetical age of this property." **Acta Veterinaria. Budapest**, 8 (3), 257–263. [Russian summary.]

Oshmarin has studied the differentiation of the trematode body into an anterior motor and posterior genital part and the mode of movement and fixation in *Echinostoma paraulum*, which shows this differentiation. He considers that this differentiation is a primary phylogenetic property, *Anchitrema sanguineum* being thought to be one of the ancestral representatives of the Lecithodendriidae. Partial or complete absence of differentiation is a secondarily acquired character, i.e. specialization due to a change in localization of the worms in the course of evolution (e.g. *Mosesiella caprimulgi* and *Eumegacetes*). It should be noted, however, that the more marked differentiation and the variable position of the ventral sucker in Strigeata are secondary characters.

G. I. Pozniak

Miscellaneous

532—EICHLER, W., 1959. [Parasitologische Abteilung, Bezirks-Hygiene-Institut, Potsdam, East Germany.] "Der Dok.-Dienst 'Angewandte Parasitologie'." **Monatshefte für Veterinärmedizin**, 14 (10), 315–317.

The Institut für Dokumentation in Berlin has initiated a card index system for "Applied Parasitology" covering literature published since January 1957. Each card (post-card size) gives the author, title, date, journal, a brief abstract and classification marks. The system is not claimed to be comprehensive but aims to make available as quickly as possible the most important and readily obtained literature in parasitology, with special accent on practical aspects. Subscribers may order all the cards or choose certain subjects only.

G. I. Pozniak

533—FOSTER, A. O., 1960. [Animal Disease and Parasite Research Division, Agricultural Research Service, Beltsville, Maryland, U.S.A.] "Parasitological speculations and patterns. **Journal of Parasitology**, 46 (1), 1–9.

In this, the Address of the retiring President of the American Society of Parasitologists, Foster discussed the Society and its disciplines. Parasitism is a way of life and its study has evolved a complex and important scientific discipline. Discussing the future of parasitology, Foster dealt with losses due to parasites under the headings: (i) the larval phases of *Nematodirus* species, pointing out that the immature parasites are less host-specific than the adults; (ii) helminths as reservoirs of disease; (iii) helminths as excitants of disease, e.g. of "black disease",

tumours, etc.; (iv) helminthiasis as a stress factor, e.g. *Nematodirus* damaging sheep infected with *Haemonchus contortus*, the effects of *Ascaris* on infectious bronchitis of pigs, the possible relationship of schistosomiasis with typhoid and paratyphoid fevers; (v) nutritional effects of helminths, e.g. removal of vitamins by *Diphyllbothrium* and ascarids of poultry, and ascariasis associated with disturbances of protein assimilation.

G. Lapage

- 534—MICHAJŁOW, W., 1959. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "Resistance of hosts and endoparasites; parasitological groups of hosts and types of systems 'host-parasite'." *Acta Parasitologica Polonica*, **7** (23/35), 467–487. [Polish summary pp. 486–487.]

With a view to a systematic classification of host-parasite systems, Michajłow discusses the resistance exhibited by hosts and parasites, host specificity of parasites, factors deciding the formation of host-parasite systems and different types of such systems. The work refers principally to tapeworm-copepod systems which have already been studied from this aspect.

G. I. Pozniak

- 535—RUKAVINA, J. & DELIĆ, S., 1960. [Zavod za parazitologiju i invazione bolesti, Veterinarski fakultet, Univerzitet u Sarajevu, Yugoslavia.] "Trihineloza. Sadaanje stanje nekih pitanja njezinog širenja, održavanja i profilakse." *Veterinaria. Sarajevo*, **9** (2), 237–245. [English summary p. 237.]

Rukavina & Delić discuss the recent literature on the epizootiology and epidemiology of trichinellosis and suggest control measures and further study of natural foci in Yugoslavia.

N. Jones

- 536—SERGIEV, P. G. & KROTOV, A. I., 1959. [Gelmintologicheskii otdel, Institut meditsinskoi parazitologii i tropicheskoi meditsini, Ministerstvo zdravookhraneniya S.S.S.R.] [The contamination of the environment by helminth eggs during the period of treatment of helminthiasis. (Experimental observations.)] *Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow*, **28** (5), 584–585. [In Russian: English summary p. 585.]

The average daily number of viable eggs passed in the faeces within the first few days after anthelmintic and laxative treatment of cats against *Toxocara mystax* was 13 times that passed before treatment. It is, therefore, advisable to avoid environmental contamination with such faeces and to choose, for mass treatment, a time which is most unfavourable for egg development.

G. I. Pozniak

BOOK REVIEWS

- 537—MACFARLANE, L. R. S., 1960. [Royal Army Medical College, London.] "A short synopsis of human protozoology and helminthology." *Edinburgh & London: E. & S. Livingstone Ltd.*, vii+251 pp.

"This little book is based on notes used to prepare students at the Royal Army Medical College for the Diploma of Tropical Medicine and Hygiene, and also for the training of pathologists."

It is a concise account of the protozoal and helminthic parasites of man which also includes parasites of undetermined nature such as sarcocysts, etc. The protozoa are dealt with first in a section of about 80 pages which contains coloured plates of the principal parasites and black and white illustrations.

The helminths occupy more than half of the book, starting with the nematodes and followed by trematodes and cestodes. These are treated in the same way as the protozoa. There is an appendix with practical hints on staining blood films and helminths and the examination of faeces; this is followed by a glossary of lesser known terms in parasitology and a comprehensive index.

The book is a useful summarization which will no doubt be helpful to examination candidates although they may find the inclusion of many rare or accidental helminths somewhat of a burden in their "swotting". These could well have been omitted to make space for more detailed information on the well known forms. Mistakes in spelling and in fact, apparently inseparable from text-books of this kind, are present, and call to mind the cynical opinion that text-books are instruments for the perpetuation of errors. The time-honoured one about elephantiasis being mainly on the upper parts of the body in *Brugia malayi* infections has, of course, appeared again (p. 132). On page 85 (lines 4-6) there is a surprising statement about the female genitalia of nematodes. On pp. 121-122 the four anthroponoses due to *Gongylonema*, *Gnathostoma*, *Physaloptera* and *Thelazia* are mentioned but the names of the animal hosts are strangely omitted.

J. J. C. Buckley

538—RODGER, F. C., 1959. "Blindness in West Africa." London: H. K. Lewis & Co. Ltd., xiv+262 pp.

This monograph is the report of a team under the organization of the Royal Commonwealth Society for the Blind and directed by Dr. Rodger, who spent four years (1952-56) assessing the nature and incidence of the common eye diseases in a large tract of West Africa, with special reference to the clinical aspects of onchocerciasis.

In Part I the epidemiological factors in the areas surveyed, i.e. Northern Ghana, Northern Nigeria and the Cameroons, are first outlined and previous work in these regions is referred to. The survey involved a random village to village examination of inhabitants, children as well as adults (children in the past have been rather overlooked on account of practical difficulty attending thorough eye examinations of the young) and the type of investigation varied from general surveys of the blind, with assessment of the D.Q. (density quotient—a mathematical estimate designed by the author in assessing the incidence of disease due to onchocerciasis), surgical operations (a number of eyes were removed for pathological examination), trials with filaricidal drugs, ocular manifestations of sleeping sickness, establishment of the presence of onchocerciasis, etc. A comparison of the main blindness diseases in the three areas showed that the percentage blind in Northern Ghana was for onchocerciasis 46%; trachoma 20%; senile cataract 7.3%; smallpox 1.7%; optic atrophies 3%; measles 4.8%; others 17.2%. In the Cameroons these figures were respectively 26.5%; 27.1%; 17.4%; 1.8%; 2.1%; 0%; 25.1%. There was a marked difference in some of the figures in different epidemiological areas of Northern Nigeria. Thus, in areas of medium to heavy onchocerciasis plus syphilis the figures were: onchocerciasis 29.6%; trachoma 11.6%; senile cataract 13.5%; smallpox 1.1%; optic atrophies 14.2%; measles 1.1%; others 28.9%. In non-endemic onchocerciasis areas plus syphilis in Northern Nigeria the figures were: onchocerciasis 3.2%; trachoma 39.9%; senile cataract 13.7%; smallpox 12.8%; optic atrophies 4.5%; measles 1.3%; others 24.6%. In chapters 4, 5 and 6 of Part I, the author discusses respectively the statistical analysis of the results, nutriment factors in blindness and blindness in African children.

In Part II the emphasis is on onchocerciasis and other filarial infections are also mentioned, i.e. *Wuchereria bancrofti*, *Loa loa*, *Dipetalonema perstans* and *D. streptocerca*. Chapter 8 is devoted to clinical manifestations of ocular onchocerciasis. The author discusses and illustrates with diagrams the development of the following conditions, onchocercal limbitis, punctate keratitis, uveitis and optic neuritis.

In Chapter 9 the methods employed in assessing the density of onchocerciasis in a community are described, i.e. I.D.F. (individual density figure) and D.Q. (density quotient). This chapter does not lend itself to condensation and should be read at first hand by those who are interested in the mathematical approach; it also contains results of onchocerciasis surveys of the three regions, illustrated by maps.

In the final chapter the pathogenesis of ocular onchocerciasis is dealt with briefly (a detailed report is to be published separately). Experimental work on this aspect of onchocerciasis, by means of inoculation of dead microfilariae into different parts of the eyes of experimental animals resulted in the reproduction of the four main lesions, limbitis, sclerosing keratitis, and

anterior and posterior exudative uveitis, as seen in man. Injection of dead microfilariae into the eyes of human subjects, previously either non-infected or heavily infected gave interesting results which were summed up as follows: "These results explained in a satisfactory manner why it is that in a hyperendemic area such as North Ghana where it was estimated that 600,000 people are infected and the I.D.F. generally very high, only two or three percent exhibit ocular lesions causing a defect of vision. In short, it would seem that, although the nearer the nodule is to the eye, the earlier it will be invaded in force, the less likely for immunity to develop and the more likely for ocular onchocerciasis to occur; where the usual course of infection takes place (that is invasion from the lower limbs upwards over several years) a degree of immunity will exist by the time the eye is invaded". J. J. C. Buckley

539—WORLD HEALTH ORGANIZATION, 1960. [Palais des Nations, Genève, Switzerland.] "Bibliography on bilharziasis 1949–1958." **Geneva: World Health Organization, 158 pp.**

This bibliography of the world literature on bilharziasis covers material published between 1949 and 1958 and thus brings up to date the two earlier bibliographies on the same subject [Khalil, M., 1931. "The bibliography of schistosomiasis (bilharziasis), zoological, clinical and prophylactic." **Publication No. 1, Faculty of Medicine, Egyptian University, Cairo, 503 pp.** Bouillon, A., 1950. "Bibliographie des schistosomes et schistosomias (bilharzioses) humaines et animales de 1931 à 1948." **Mémoires de l'Institut Royal Colonial Belge. Section des Sciences Naturelles et Médicales, 18 (5), 141 pp.**] References are arranged alphabetically by author, each item being numbered. A combined subject and geographical index is provided in both English and French, consultation being facilitated by the wide spacing of the items. Wherever access to the original material was possible the reference cited has been verified. Snails are indexed under the names used by authors and pharmaceutical preparations under the approved international non-proprietary name. This clearly printed and well produced work is thoroughly comprehensive and provides an invaluable bibliographical tool for research workers in the field of schistosomiasis.

J. M. Watson

540—YAMAGUTI, S., 1959. "Systema helminthum. Vol. II. The cestodes of vertebrates." **New York & London: Interscience Publishers, Inc., vii+860 pp.**

This book "is designed primarily for laboratory workers in the field of helminthology, for use in determining the generic identity of the helminths with which they are dealing". Four pages are given to a general morphological account with a brief list of larval forms occurring in the principal orders. Each of the subsequent chapters is concerned with the tapeworms from fishes, amphibians, reptiles, birds and mammals respectively. The families, genera and species within each order are treated alphabetically except that the type genus is always mentioned first. In a chapter entitled "Systematic survey of the cestodes of vertebrates and their host relationships" is found a list of orders, families, sub-families, genera and sub-genera, arranged in an order identical to that in the first chapters, with a conventional letter facing the genus to indicate the host group.

The bibliography occupies 159 pages and is incomplete although the book is said to include "all the recent advances in the field of systematic helminthology up to February 1959"! The illustrations occupy 140 pages and the 584 figures are grouped into 70 plates irrespective of any possible affinities of the species included on the same plate. The figures are reproduced photographically from the original drawings and greatly reduced. In most cases the result is unsatisfactory and at least 50 figures are useless even to a specialist; some are out of focus and a few upside down (figs. 85, 161, 302c). The original lettering of the figures has been retained so that abbreviations appear, when legible, in German, French and English. The really important details cannot be seen in most figures and it is astonishing that such an expensive book could be so poorly illustrated. The book closes with an alphabetical index of 91 pages.

Most helminthologists agree that tapeworms are a difficult group to study and that technique, state of preservation or maceration play an important part in the end result. Many of the older descriptions are, by modern standards, insufficient and in most cases the original material is no longer available. Faulty technique and badly preserved material are the commonest causes of many of the unreliable descriptions found in contemporary papers. For this reason, the establishment of new genera based upon such descriptions and without the original material being investigated should be officially discouraged. Of the 31 new genera created by Yamaguti, all but two are based on other author's descriptions. This leads to the creation of new genera for species which are inexistent, e.g. *Oncobothriocephalus* n.g., made for *Ptychobothrium armatum* from a bird, which species was recognized by its author more than 30 years ago as based on a wrong host, the true host being a Nile fish. *Johria* n.g. is based on a description of a worm devoid of a scolex and of which the uterus is unknown. *Acotylepis* n.g. is proposed for *Hymenolepis anacetabulata* = *Coronacanthus polyacantha* = *H. integra*. *Allohaploparaxis* n.g., for *H. sagitta*, is said to lack an external seminal vesicle and yet this is apparent in the original figure reproduced by Yamaguti (fig. 247). *Diorchis occlusa* is an obvious synonym of *H. liguloides* but is made type of *Aporodiorchis* n.g.

The 20 new genera introduced by Yamaguti into the family Hymenolepididae confound the confusion that has already been created by the Russian authors and in no way further a clear understanding of this difficult group. Critical systematic work previously accepted by leading authorities is not even mentioned. *Diplogynia* is correctly placed in Hymenolepididae but *Diploposthe* and *Jardugia* are relegated, together with the unrelated genus *Diplophallus*, to the family Diploposthidae. The genus *Skorikowia*, a synonym of *Haploparaxis* is reinstated based on Linstow's description but Yamaguti has ignored the fact that Fuhrmann re-examined the type and found one not two testes as stated by Linstow. *Acanthocirrus* is once again put into synonymy with *Gryphorhynchus* even though the two genera have been shown to be quite distinct. Recent publications based on type material have demonstrated that *Southwellia* is founded on a faulty description; that *Multicapsiferina* is a composite species made up of several different fragments; that *Tetracisdicotyla* is a synonym of *Crepidobothrium*; that *Sobolevina* is a synonym of *Ascometra*; that *Unciumia* is a synonym of *Choanotaenia*; that *Spirometra* is a synonym of *Luehella*, etc. . . . But these are ignored.

Amongst the hosts of "*Octopetalum*" numidae is listed *Porogynia paronai*, a tapeworm. *Mesocetoides dissimilis* from *Myonax* (Carnivora) is attributed to a bird. On page 224, in a footnote, Yamaguti mistakenly attributes to the reviewer the misspelling of *Otiditaenia*, namely *Ophiotaenia*.

One finds amongst the species grouped within the genera many synonyms which were relegated as such several years ago, after re-examination of the types. For example the numerous species attributed to the genus *Raillietina* and shown to be synonyms of *Inermicapsifer arvicanthidis* = *I. madagascariensis* are listed under *Raillietina*.

The unfortunate laboratory worker confronted with a tapeworm from a dog will wonder how to identify it when he knows nothing of its larval form (p. 436). On the other hand the same key states "larva unknown" and refers to *Cladotaenia* (p. 441) where the larva is said to have been described by Markowski!

The Caryophyllaeida are included in the Cestodaria, an arrangement that was shown 30 years ago to be based on wrong premises. For some undisclosed reason, Yamaguti does not believe that the scolex of *Haplobothrium* bears four proboscides. The whole treatment of the Tetraphyllidea of Elasmobranchs is out of date since the publication of Euzet's monograph based on freshly collected material. Triloculariidae n.fam. has no taxonomic value since it is based on the erroneous assumption that the genital pore is at the posterior end of the segment, a mistake already corrected by Euzet (1952) in a paper not cited in the bibliography.

It is somewhat surprising to find no mention whatever of host specificity, a fundamental biological character of tapeworms that has been amply demonstrated since 1869 when it was first discovered by Krabbe.

Yamaguti's *Systema Helminthum* is an ambitious work bearing the same title as Diesing's book published nearly a century ago. But where Diesing produced a critical taxonomic system the present book is a compilation of material which has been accepted at its face value, not treated critically and arranged in alphabetical order. Is this to be called a system in the usual taxonomic sense?

Jean G. Baer

[The following new taxa are proposed in this volume: (i) families—Adelobothriidae, Cephalochlamydidae, Maccallumiellidae, Parabothriocephalidae, Tetragonocephalidae, Triloculariidae and Triplotaeniidae; (ii) subfamilies—Aporhynchinae, Bothriocotylinae, Ditestolepidinae, Gilquiniinae, Gyrocoeliinae, Prosobothriinae and Rajotaeniinae; (iii) genera—*Abortilepis* for *Hymenolepis abortiva*, *Acotylepis* for *H. anacetabulata*, *Allohaploparaxis* for *Drepanidotaenia sagitta*, *Aporodiorchis* for *Diorchis occlusus*, *Baerfainia* for *Raillietina* (R.) *anoplocephaloides*, *Chelacanthus* for *D. parviceps*, *Decacanthus* for *H. arcticus*, *Diorchirailletina* for *Davainia contorta*, *Hispaniolepidoides* for *Hispaniolepis villosoides*, *Hymenosphenacanthoides* for *Hymenolepis ondatrae*, *Johria* for *Eugonodaeum testifrontosa*, *Jonesius* for *Diorchis ralli*, *Kowalewski* for *Hymenolepis parvulus*, *Linstowi* for *D. serpentatus*, *Lobatolepis* for *H. lobulata*, *Lockerrauschia* for *H. intricatus*, *Maccallumiella* for ?*Taenia patini*, *Mayhewia* for *H. corvi*, *Oncobothriocephalus* for *Ptychobothrium armatum*, *Parvibursa* for *H. chrysolampidis*, *Pseudamphicotyla* for *Amphicotyle quinquarii*, *Pseudocephalochlamys* for *Dibothriocephalus xenopi*, *Pseudoshipleya* for *Shipleyia farrani*, *Ptychobothrioides* for *Bothriocephalus spiraliceps*, *Schillerius* for *Diorchis parvogenitalis*, *Schmelzia* for *H. linderi*, *Spiniglans* for *Choanotaenia microsoma*, *Stylolepis* for *Sphenacanthus longistylus*, *Triodontolepis* for *H. miniopteri*, *Tubanguiella* for *Kowalewskiella buzzardia*, *Vampirolepidoides* for *H. krishna* and *Woodlandia* for *H. phalacrocorax*; (iv) subgenera—*Oschmarenia* (*Chandleria*), *Hispaniolepis* (*Otidilepis*), *Endorchis* (*Pseudendorchis*), *Otobothrium* (*Pseudotobothrium*) and *Staphylocystis* (*Staphylocystoides*). New synonyms, new combinations and emendations are not included in this list.—S. Willmott.]

SUMMARY OF REPORTS

[Only those sections relating to helminthology are abstracted.]

541—BRITAIN. "Report of the Agricultural Research Council for the year 1958–59."

London: H.M. Stationery Office, vii+213 pp. (Received 1.7.60.)

Agricultural research during the last ten years has been directed to the development of methods for the assessment of eelworm infection of crops and their application to country-wide surveys. Such methods have already been worked out for the pea root, cereal root and tulip eelworms. Helminthological work done at individual stations was briefly as follows: (i) at Rothamsted Experimental Station on the development of methods of control of the potato and beet root eelworms now known to attack plants previously thought resistant and on the movement of nematodes in soil and the hatching of cysts; (ii) at the Glasshouse Crops Research Institute on the life-history of an eelworm parasitic on the phorid *Megaselia halterata*, a common mushroom pest in this country; (iii) at the Scottish Horticultural Research Institute on the transmission by *Xiphinema* of a plant virus; (iv) at the Moredun Institute on the raising of worm-free lambs for resistance and self-cure experiments, on the successful recovery from faeces of *Nematodirus battus* eggs free from debris, on resistance of rats to *Nippostrongylus muris*, on the *in vitro* culture of parasitic stages preliminary to the production of uncontaminated antigens, and on various aspects of nematode infections in the field; (v) at the Rowett Research Institute on immunity of inbred rats and outbred hooded rats to *N. muris*; and (vi) at the Houghton Poultry Research Station on the biology and life-cycle of *Ascaridia dissimilis*.

G. I. Pozniak

542—IRELAND. "Annual Report of the Minister for Agriculture (28th), 1958-59."

Dublin: Stationery Office, vi+167 pp.+Appendices 85 pp. (Received 27.6.60.)

The Department of Agriculture reports serious losses of sheep in many parts of the Republic of Ireland due to liver-fluke disease which became widely prevalent in the latter part of 1958 following an unusually heavy rainfall. The following helminth infections were encountered during routine examinations at the Veterinary Research Laboratory: *Fasciola hepatica*, trichostrongyles, *Nematodirus* and *Moniezia* in cattle and sheep; *Dictyocaulus* in cattle; strongyles and ascarids in equines; *Ascaris* and *Hyostrogylus rubidus* in pigs; and hookworms and *Toxocara* in dogs.

G. I. Pozniak

543—ST. VINCENT. "Report of the Department of Agriculture, Forestry and Fisheries, St. Vincent, for the year ended 31st December, 1955."

Kingstown: Government Printer, 68 pp. (Received 22.6.60.)

The helminths affecting livestock on St. Vincent Island during 1955 were stomach worms in sheep and goats, the large roundworm and *Macracanthorhynchus* in pigs, and hookworms and large roundworms in dogs. In chickens, a rare case of eye-worm was recorded while tapeworm infection had dropped markedly. Little work has so far been done on eelworms which are nevertheless serious. *Aphelenchoides cocophilus* infection of low incidence occurred on coconut palms.

G. I. Pozniak

NEWS AND NOTES

The VIth International Nematology Symposium

WILL BE HELD at the State Agricultural College, University of Ghent (Belgium) from 24th to 28th July, 1961. Information may be obtained from Professor J. van den Brande, Rijkslandbouwhogeschool, Coupure Links, 235, Ghent, Belgium.

† Schistosomiasis in the Eastern Mediterranean

IN HIS ANNUAL REPORT Dr. A. H. Taba, WHO Regional Director for the Eastern Mediterranean, referred to schistosomiasis which is endemic in eleven countries of this region. He spoke of the urgent necessity of intensifying research on the vectors, on molluscicides, on chemotherapy and chemoprophylaxis and on agricultural practices favouring its spread.

Nematology in India

DURING A RECENT nine-week tour of centres in India Mr. F. G. W. Jones, head of the Nematology Department, Rothamsted Experimental Station, spent three weeks at Aligarh Muslim

University with the object of starting up a Nematology Section. Workers in this field are requested to send any available reprints to Dr. Abrar Mustafa Khan, Botany Department, Aligarh Muslim University, Aligarh, U.P., India.

† Anaemia in Mauritius

FROM A SURVEY commenced in 1955 it is concluded that circumstances in Mauritius "appear suitable for the introduction of enrichment with iron of the national diet as a means of reducing the incidence and severity of hypochromic microcytic anaemia in the whole population". It is estimated that at least 37.5% of the population suffer from hookworm infection leading to chronic loss of blood.

Angewandte Parasitologie

A NEW PARASITOLOGICAL JOURNAL is published by Veb Gustav Fischer Verlag Jena. Four parts will be issued annually. The editor is Prof. W. Eichler (Berlin) with Prof. O. Jirovec (Prague), Dr. H. B. Peters (Heidelberg) and Z. Kozar (Warsaw) as co-editors.

† From *WHO Chronicle*.

REPORTS OF MEETINGS

The First International Conference on Trichinelliasis

MET IN WARSAW on 12th-13th September, 1960 under the chairmanship of Professor W. Stefański and was attended by about 150 persons representing 19 countries. The papers read and the

subsequent discussions will be published in the near future. During the meeting an International Commission for the Control of Trichinelliasis was elected consisting of Professor K. I. Skryabin (honorary president), Professor W. Stefański (president), Professor Z. Kozar (secretary) and six committee members.

PROGRAMMES AND PERSONNEL

Mr. A. E. Trotman, C.M.G.

WHO WAS created a Knight Bachelor in the New Year's Honours, and who took up his duties as Secretary to the Executive Council of the Commonwealth Agricultural Bureaux on 1st January, died suddenly on 14th January, three weeks before he was due to receive his accolade. He will be succeeded by Sir Thomas Scrivenor, C.M.G., who will take up his duties on 10th April, 1961.

Mr. T. J. Coyle

OF THE Animal Health Research Centre, Entebbe, Uganda, will be in the United Kingdom until May, 1961.

Mr. R. I. Sommerville

OF THE McMaster Animal Health Laboratory will be visiting the United Kingdom from 28th March to 5th May, 1961.

Mr. J. J. Hesling

HAS LEFT the Nematology Department, Rothamsted Experimental Station, to take up an appointment at the Glasshouse Crops Research Institute, Rustington, Sussex, U.K.

Dr. I. W. Parnell

HAS JOINED the staff of the Hydatid Research Unit, New Zealand Medical Research Council, Medical School, Dunedin, New Zealand.

Dr. Elvio H. Sadun

HAS COMPLETED a two-month assignment with the World Health Organization during which he visited European and Middle Eastern laboratories in connection with problems of the immuno-diagnosis of schistosomiasis.

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